THE

NAUTILUS

A QUARTERLY JOURNAL
DEVOTED TO THE INTERESTS
OF CONCHOLOGISTS

VOL. XLVI
JULY, 1932 to APRIL, 1933

EDITORS AND PUBLISHERS
HENRY A. PILSBRY
Curator of the Department of Mollusks and Marine Invertebrates
Academy of Natural Sciences
H. BURRINGTON BAKER
Associate Professor of Zoology, University of Pennsylvania
PHILADELPHIA

CONTENTS
OF
THE NAUTILUS, XLVI.

INDEX TO NEW GENERA, SPECIES AND SUB-SPECIES

The Nautilus.

Vol. XLVI JULY, 1932. No. 1

THE SECOND ANNUAL MEETING OF THE AMERICAN MALACOLOGICAL UNION

The Second Annual Meeting of The American Malacological Union held in Washington, D. C., May 26 to 28, was equally as profitable and enjoyable as the Philadelphia meeting last year, and was attended by about the same number, many of whom were present on the former occasion.

The sessions were held in the National Museum to which members were welcomed Thursday afternoon by Dr. J. E. Graf, Associate Director. In responding, Dr. Henry A. Pilsbry, President of the Union, said that it was fitting that the first meeting of this national association should have been held in Philadelphia where mollusks were first studied in America; and that Washington, the seat of the great collection of the National Museum, should be the scene of the first anniversary.

Dr. Pilsbry's address followed, his subject being "The Distribution of the Family Pupillidae". Other papers were: "A Word on the Liguus Situation in Southern Florida", by M. K. Brady. "Clamming in Florida and Elsewhere", by Berlin Hart Wright. "Mollusks of the Idaho Transition Zone", by Horace Burrington Baker. "Forms of New Freshwater Fossil Mussels", by William B. Marshall and Edgar Oliver Bowles, presented by Mr. Bowles.

In the evening Dr. Paul S. Galtsoff spoke on "The Ins and Outs of the Oyster", with lantern illustrations.

The first paper on Friday morning was by Joshua L. Baily, Jr., on "The Founders of California Conchology".

This was followed by Dr. William J. Clench on "The Distribution of Certain Solomon Island Land Shells". "The Cerions of Cay Sal", by Dr. Paul Bartsch and Edgar O. Bowles was presented by Mr. Bowles. "The Cerions of Porto Rico" by Dr. Bartsch and José A. Gallardo, was given by Mr. Gallardo. A new Subgenus and Species of Cerion from Little Inagua, by Dr. Paul Bartsch and Mrs. M. G. Bowman, was exhibited and discussed.

The concluding series of scientific papers given Friday afternoon comprised the following: "Pathologic and Abnormal Fossil Shells", by F. Stearns MacNeil. "Snails as Hosts and Carriers of Nematodes", by B. G. Chitwood. "Ecological Study of Mollusks of Delaware Bay", by Horace G. Richards. "Food of Marine Diving Ducks", by Clarence Cottam. "Drilling of Predaceous Gastropods", by William B. Marshall.

A heavy rain during the afternoon prevented the taking of a photograph of the attending members which had been planned, but the rain finally ceased and the evening was pleasantly spent in a visit to the Congressional Library.

Between the afternoon and evening programs collecting was done by a few members on the Potomac Flats near Mt. Vernon where some specimens of *Bithynia tentaculata* were found, the first to be recorded from the Potomac River, or anywhere in the Chesapeake Bay system.

The classical collecting ground for American fossils in the Calvert formation at Plum Point on Chesapeake Bay was visited and explored on Saturday, followed by the Annual Dinner in the evening.

The concluding address was given here by Dr. Cloyd H. Marvin, President of George Washington University, who exhibited some unusual films of undersea life in the West Indies. Some of these were in color and were made by Dr. Marvin last summer when he accompanied Dr. Bartsch on his collecting trip to these seas.

At the business session on Thursday a resolution was passed favoring the immediate establishment of the proposed Everglades National Park to insure among other ob-

jects, the protection and preservation of Liguus which otherwise will soon be exterminated in Florida by fires and unwise collecting.

A cordial invitation had been received from Stanford University to hold the next meeting in California, but owing to present conditions, and while recognizing that one meeting in five should be west of the Rockies to accommodate the fifth of the membership residing in that territory, it was thought best to defer the West Coast meeting. It was decided therefore to hold the meeting of 1933 in Boston, and that of 1934 in California if possible.

Two new classes of membership were instituted, Honorary and Corresponding, the latter to provide for foreign members. Dr. Charles Torrey Simpson, Dr. Victor Sterki and Dr. Bryant Walker were the first to be placed on the honorary list, in recognition of their great services to the science.

A plea was made for the formation of local chapters which would report annually to the Union, thus encouraging systematic collecting of local material and extending the scope of this organization.

Officers elected for the year are:

Dr. Paul Bartsch, President, succeeding Dr. Henry A. Pilsbry.

Prof. Junius Henderson, Vice-President.

Norman W. Lermond, Corresponding Secretary.

Mrs. Harold R. Robertson, Financial Secretary.

Members of the Council additional to officers: Dr. William J. Clench, Calvin Goodrich, Mrs. Ida S. Oldroyd, Dr. Henry A. Pilsbry.

Dr. Paul Bartsch and his staff are to be congratulated on the perfection of their arrangements and the interesting program, which made the three days of our Second Meeting pass all too quickly.

THE RANGE OF POLYGYRA AND OF GONIOBASIS IN CALIFORNIA

BY JUNIUS HENDERSON
University of Colorado Museum

In a recent paper on Molluscan Provinces in the Western United States (Univ. Colo. Studies, XVIII, 183, 1931), I inadvertently made the somewhat misleading statement that *Polygyra* and *Goniobasis* are absent from the Californian Province, which was said to comprise "most of California". The map placed the dividing line a long way north of San Francisco Bay. Perhaps it would be better to draw it much nearer the Bay. However, as I explained, it is impossible to draw definite lines to separate molluscan provinces where there are no sharp, definite physical or environmental barriers, because of the geographical overlap of important groups in such regions. In the case of California the zone of overlap or transition is several hundred miles wide as shown by a study of such genera as *Margaritifera, Gonidea, Helminthoglypta, Micrarionta, Monadenia, Polygyra, Goniobasis* and others, all of which must be considered, not any one genus alone. Nevertheless, even if the line should be moved much farther south, *Polygyra* would still extend well south into the Californian Province, as it has been long known to range at least as far south as San Luis Obispo County.

I have found no *Goniobasis* south of San Francisco Bay, and have seen none from that region in other collections. *G. circumlineata* Tryon was described as from "Mission San Antonio, Cal.; Shasta Co., Cal. W. Newcomb. Pitt River, Cal. Dr. J. S. Newberry. Feather River, Cal. J. H. Thomson." Mission San Antonio de Padua, the only Mission San Antonio in California of which I have found a record, is in Monterey County. This is almost certainly not the type locality. Cooper gave the range of this form as from San Antonio Creek in Marin County to Pitt River, in his geographical catalogue published by the California Mining Bureau. That Bureau's geological map, by J. P. Smith, shows a creek by that name, draining into the north end of Tomales

Bay, but on the Point Reyes sheet of the U. S. Geological Survey it is called Walker Creek. Both maps show the San Antonio Creek which heads up toward Tomales Bay and flows southeastward into San Pablo Bay, forming the northeastern boundary of Marin County. Last July the bed of this creek was entirely dry where the main north-south highway crosses it, and farmers there told us that there was no water up the creek, so we did not go up. In crossing from Petaluma to Point Reyes we found no *Goniobasis*. Dr. G. D. Hanna has furnished me the following statement:

"It is very unlikely that *G. circumlineata* came from the Mission in Monterey County, on the San Antonio River. There are many San Antonio Creeks in the state and the one cited by Cooper may be the original locality; there is a vague report that a chapel was established at one time on the San Antonio Rancho at the head of the creek, but this has not been confirmed. There is another San Antonio Creek, a branch of Alameda Creek, which discharges into the southeast end of San Francisco Bay. This creek is approximately four miles from Mission San José. Since Newcomb lived on the east side of the Bay, this locality seems plausible. This begins to look like just another one of those many indefinite localities we will have to worry about for years. The southernmost record for *Goniobasis* in our collection and in Mr. Allyn G. Smith's collection is Salmon Creek, which flows into the Pacific Ocean at the extreme southwest corner of Sonoma County."

The objection to the creek near Mission San José as the type locality is that no one seems to have found any *Goniobasis* anywhere near there since *circumlineata* was published. There is a San Antonio Creek southeast of Palo Alto, as shown on the U. S. Geological Survey topographic sheet, but last summer the bed of the creek was dry where we examined it, and so far as I have learned no one ever found any *Goniobasis* anywhere near that locality. In travelling northward from San Francisco Bay, our first encounter with this genus was about six miles north of Santa Rosa, though we have specimens from Occidental, obtained by Mr.

E. P. Chace. It seems very probable that Sonoma County, or perhaps Marin County, is the present southern limit of the genus in California, though fossil species have been reported from far to the southeast.

NEW SPECIES AND VARIETIES OF HELISOMA AND GYRAULUS FROM CANADA[1]

FRANK C. BAKER

Recently, a large collection of Canadian mollusks was received by the Natural History Museum from Dr. A. R. Cahn which probably included the largest aggregation of forms referred to *Helisoma corpulentum* ever studied by a conchologist. All ages were represented. A study of this material shows that the group is composite, including several species and races, and that certain forms which have been referred to other species were incorrectly placed, and represent new forms or belong to recognizable older names. The whole question of the variation of the Canadian species of the *trivolvis-corpulentum* group will be discussed in a paper to appear in the Canadian National Museum report, in which the new forms will be figured. Diagnoses only of the new forms are given in this paper.

HELISOMA CORPULENTUM (Say).

Planorbis corpulentus Say, Long's Exped., II, p. 262, pl. xv, fig. 9, 1924.

In his description of *P. corpulentus* Say mentions the coarse wrinkles of the sculpture which he calls "rugged". Specimens from one of the type localities, Rainy Lake, exactly correspond with this description and may be taken as typical. This form is common in many lakes in Ontario, especially in Rainy Lake region. The rib-like wrinkles are about one millimeter apart. Adult specimens of the size of Say's figured specimen are in the Canadian collections.

[1] Contribution from Natural History Museum, University of Illinois, No. 69.

HELISOMA CORPULENTUM MULTICOSTATUM, new race.

Shell differing from typical *corpulentum* in having finer rib-sculpture, three costae in the space of a millimeter; the basal whorls very flat, showing nearly three full turns, while *corpulentum* shows a trifle more than two whorls; the shell is also larger, with nearly one-half more whorl; the whorls on both base and spire are usually more sharply carinate.

Height 13.8; Gr. diam. 24.0; Ap. H. 11.8; Diam. 8.0 mm. Holotype.

Height 15.5; Gr. diam. 29.5; Ap. H. 13.0; Diam. 8.5 mm. Paratype.

Height 14.2; Gr. diam. 26.8; Ap. H. 11.5; Diam. 7.8 mm. Paratype.

Height 13.5; Gr. diam. 20.0; Ap. H. 11.1; Diam. 6.6 mm. Paratype.

Holotype, Z32306; paratypes, Z32307, Museum Natural History, University of Illinois; paratypes, 158592, Academy of Natural Sciences of Philadelphia.

Type locality: Kahnipiminanikok Lake, Rainy River District, western Ontario, Canada.

This race is abundant in most of the lakes of western Ontario, usually replacing typical *corpulentum*. It will be recognized at once by its flat lower surface, sharply angled whorl below, and fine sculpture.

HELISOMA WHITEAVESI, new species.

This species may be recognized by the great axial height of the body whorl at the aperture, the flat, almost truncated spire surface, the fine striae, finer than *multicostatum*, the flatly-rounded base showing barely two whorls, and the large ear-shaped aperture, which gives the shell a physoid aspect.

Height 19.0; Gr. diam. 24.0; Ap. H. 15.5; Diam. 9.0 mm. Holotype.

Height 18.2; Gr. diam. 23.2; Ap. H. 15.0; Diam. 9.0 mm. Paratype.

Height 16.8; Gr. diam. 21.5; Ap. H. 14.2; Diam. 8.1 mm. Paratype.

Height 12.0; Gr. diam. 10.4; Ap. H. 11.5; Diam. 5.0 mm. Immature.

Holotype, Z32311; paratypes, Z32312, Museum of Natural History, University of Illinois; paratypes, 158591, Academy of Natural Sciences.

Type locality: Lac des Mille Lac, Thunder Bay District, western Ontario, Canada.

The striking heterostrophe shape, flat spire and high axial dimension distinguish this species. It is related to the race *multicostatum* of *corpulentum*, but no connecting specimens have been observed in any of the numerous lots examined. The radula is also peculiar. It is at present known only from the type locality.

HELISOMA INFRACARINATUM, new species.

Shell resembling *Helisoma pilsbryi* in general form but distinguished by a more or less heavy carina in the center of the basal whorls; the umbilical region is more sunken exhibiting three full whorls; the aperture is strongly ear-shaped, greatly expanded below and forming a strongly inverted V-shape above, and the lip is heavily reflexed, features absent in *pilsbryi;* the shell is also much thicker in *infracarinatum.* The radulae of the two species differ widely, that of *pilsbryi* having the formula 23-1-23 while in *infracarinatum* the formula varies from 32-1-32 to 37-1-37.

Height 14.0; Gr. diam. 25.5; Ap. H. 12.6; Diam. 8.5 mm. Holotype.

Height 12.3; Gr. diam. 24.0; Ap. H. 11.0; Diam. 7.3 mm. Paratype.

Height 12.3; Gr. diam. 23.0; Ap. H. 11.1; Diam. 7.2 mm. Paratype.

Height 10.0; Gr. diam. 18.0; Ap. H. 9.5; Diam. 6.0 mm. Paratype.

Holotype, Z32361; paratypes, Z32362, Museum of Natural History, University of Illinois; paratypes, Academy of Natural Sciences, No. 158594.

Type locality: Basswood River rapids, Rainy River District, western Ontario, Canada.

This species is one of the most abundant Helisomas in Canada, and its range extends well into the United States. It has been referred to both *corpulentum* and *pilsbryi* but appears distinct from either. It most nearly resembles *pilsbryi* and many specimens would be referred to this species by the shell alone. The variation in the angulation of the lower whorls is very great, in some individuals being almost absent. It is usually present in the earlier whorls thus dif-

fering from *pilsbryi*. It lacks the flattened whorls of the race *multicostatum* with which it has been confused.

GYRAULUS LATISTOMUS, new species.

Shell resembling *Gyraulus deflectus obliquus* but smaller, the whorls rounded with no sign of angulation; whorls three, rapidly enlarging in diameter; sculpture of growth lines only; spire flat, apex sunken below general surface; umbilicus deep and wide; last whorl deflected near aperture; aperture oblique, expanded, the upper part extending far forward of the basal part; inner lip forming a callus which spreads over the columellar region.

Height 2.4; Gr. Diam. 4.4; Ap. breadth 1.5; Diam. 1.3; Height 1.0 mm. Holotype.

Height 1.8; Gr. Diam. 4.0; Ap. breadth 1.4; Diam. 1.2; Height 1.0 mm. Paratype.

Holotype, Z32340; paratypes, Z32341, Museum of Natural History, University of Illinois; paratype, Academy of Natural Sciences, No. 158598.

Type locality: McAree Lake, Rainy River District, western Ontario, Canada.

This little *Gyraulus* apparently differs from all other species now known. In a way it resembles the *obliquus* race of *deflectus*, but has a less number of whorls and the aperture is quite different. The chief feature of note is the rapid expansion of the last whorl and the very wide aperture, almost round when viewed from the under surface. It is known at present only from the type locality.

A NEW SPECIES OF CRASSATELLITES FROM THE GULF OF CALIFORNIA

ERIC KNIGHT JORDAN[1]

CRASSATELLITES LARONUS, new species.

Shell large, of medium thickness, gently inflated; beaks anterior and turned posteriorly; anterior end of valve

[1] The manuscript containing the results of a study of the Pleistocene mollusks of Magdalena Bay by the late Mr. E. K. Jordan is completed and contains a figure of the species here described. The description is published in advance due to the necessity of having a name for use in publications now in progress.—L. G. Hertlein.

rounded, base broadly rounded, posterior end subtruncate, posterior dorsal margin slightly concave, lunule lanceolate, moderately impressed. Two ridges run from the beak to the posterior ventral margin; these are separated by a shallow groove; the ridges become flatter as the ventral margin of shell is approached; early portion of shell ornamented by rounded concentric folds, remainder ornamented by concentric lines of growth; hinge with broad resilium pit and moderately heavy cardinals. Length 77.2 mm.; height 55 mm.; convexity (of left valve) 14.1 mm.

Holotype: No. 5593, Calif. Acad. Sci.; from Loc. 23809 near salt works at San José Island, Gulf of California, a living shell; Dr. Fred Baker, collector. *Paratype:* No. 5592, Calif. Acad. Sci.; from Loc. 754 (C. A. S.) Magdalena Bay, Lower California; G. D. Hanna and E. K. Jordan, collectors; Pleistocene.

The Recent specimen from the Gulf of California is described as the type. Several specimens from the Pleistocene of Magdalena Bay are smaller, but apparently the young of the species which is now living in the Gulf.

Crassatellites laronus is much flatter and less rostrate than *Crassatellites gibbosus* Sowerby[2] and *C. subgibbosus* Hanna.[3] *C. altaspissus* Woodring[4] is apparently a heavier shell, more rostrate posteriorly and the anterior lateral tooth is different than is the case in *C. laronus*. *Crassatellites undulatus* Sowerby[5] is more rostrate than *C. laronus*.

---

[2] Sowerby, G. B. Proc. Zool. Soc. London, vol. 2, 1832, p. 56. "America Meridionalis (St. Elena and Xipixapi)."—Reeve, L. Conch. Icon., vol. 1, 1843, *Crassatella*, pl. 1, figs. 1*a*, 1*b*. "Western Coast of South America."

[3] Hanna, G. D. Proc. Calif. Acad. Sci., Ser. 4, vol. 14, no. 18, 1926, p. 463, pl. 28, figs. 1, 2, 3, 4. Coyote Mountain, Imperial County, California; Pliocene.

[4] Woodring, W. P. Carnegie Inst. Washington Publ. 366, 1925, p. 95, pl. 11, figs. 16, 17. Bowden Miocene, Jamaica.

[5] Sowerby, G. B. Proc. Zool. Soc. 1832, p. 56. "Puerto Portrero, Americae Centralis".—Reeve, L. Conch. Icon., vol. 1, 1843, *Crassatella*, pl. 1, figs. 2*a*, 2*b*. "Puerto Portrero, Central America."

HELMINTHOGLYPTA ARROSA MAILLIARDI PILSBRY IN OREGON AND CALIFORNIA

BY A. G. SMITH AND E. P. AND E. M. CHACE

On a recent hike in Douglas Co., Oregon, from Lookingglass, seven miles south of Roseburg, to "Devil's Rock", a single dead shell of *H. arrosa mailliardi* Pils. was found by two of the authors. Close search in the locality the next day yielded a dozen more fairly fresh specimens, adult or nearly so, and in addition, seven or eight living juvenile specimens. One very "dead" shell found was larger than the others.

This discovery is of special interest, for so far as can be determined, it is the only recent record of the genus *Helminthoglypta* in Oregon.

In the past, several species of this genus have been mentioned as having been collected in the Pacific Northwest. These are:

Helix anachoreta W. G. B.? Cooper, Am. Jour. Conch., iv, pp. 222, 230, 1868; "Klamath Co., Oregon".

Helix arrosa Gould. Binney & Bland, L. and F. W. Shells of N. A., Pt. I, p. 164,, 1869; a single specimen cited from "Columbia River".

Helix dupetithouarsi Desh. (part). Binney & Bland, L. and F. W. Shells of N. A., Pt. I, p. 174, 1869; seven specimens from "Klamath Lake, Oregon" and one from "Puget Sound,=*oregonensis* Lea". *H. oregonensis* Lea is placed in synonymy.

Helix ayersiana Newc. Proc. Calif. Acad. Nat. Sci., 1861, p. 103. Cited originally from Nootka Sound, Oregon.

Helix tudiculata W. G. B. Binney & Bland, L. and F. W. Shells of N. A., Pt. I, p. 166, 1869; cited as ranging from "San Diego, to Washington Territory". Cooper, Pac. R. R. Survey, No. 6, p. 377, 1860; "hab.—Washington Territory; Dr. Cooper".

As pointed out by Henderson,[1] these records are incorrect. They were undoubtedly based either on misidentification or on an unfortunate misplacing of locality labels.

J. G. Cooper,[2] in discussing *Helix nickliniana* Lea in 1868

[1] Henderson. Non-Marine Mollusca of Oregon and Washington, Univ. Colo. Studies, vol. XVII, no. 2, p. 74, 1929.

[2] Cooper. Am. Journ. Conch., vol. 4, pt. 4, p. 222, 1868.

says: "Dr. Newcomb's . . . . . var. *c.* 'without band' from Klamath Co., has the umbilicus closed, not malleated, lip broad, and seems distinct, perhaps a form of *anachoreta* W. G. B." What Newcomb's shell was must remain a matter of conjecture, at least until other material is collected. Obviously it was not *nickliniana,* although possibly it belonged to the *arrosa* group. However, the locality, Klamath Co., Oregon, lies almost entirely east of the Cascade Mts., far removed from the wooded coastal region where *arrosa* is normally to be found. Newcomb's shell certainly was not *anachoreta,* which is a middle Californian species, or variety of *nickliniana.*[3]

Helminthoglypta arrosa (Gould) is found all along the northern California coast from Santa Cruz Co. northward. It may cross over into Oregon, but no authentic specimens of the typical form have been reported from this State. The "Columbia River" locality is an error.

The *H. dupetithouarsi* (Desh.) from "Puget Sound" is either a locality error or is based on *Monadenia fidelis* (Gray). The shells from "Klamath Lake", however, may now be said with a reasonable degree of certainty to be a small form of *M. fidelis.* Whether this is the variety *oregonensis* (Lea) cannot be stated definitely at present, but with a large series of this form that has recently become available, no doubt this point can be soon settled with finality. A somewhat similar form has also been collected recently in the canyon of the Shasta River in Siskiyou Co., California.

The Oregon record of *Helix ayersiana* Newc. has already been corrected in later literature.[4] Its type locality is San Miguel Island, California. *Helix tudiculata* W. G. B. has not been reported from north of upper Tehama Co., California (Paynes Creek), where it has been found by one of the authors. The Oregon and Washington localities are erroneous.

---

[3] Pilsbry. P. A. N. S. Phila., vol. 78, p. 478, pl. 36, figs. 8-11, 1926 [1927].

[4] Pilsbry. Naut., XL, p. 78, 1927.

To this time, *Helminthoglypta arrosa mailliardi* Pils. has been collected from four localities that probably define the major portion of its range. It differs from all other varieties of *arrosa* in its small size, high spire, relative smoothness, and in the excessive thinness of the shell. The type lot is from Requa, Del Norte Co., California, near the mouth of the Klamath River, collected by J. W. Mailliard and Chase Littlejohn in 1921. In this lot is an unusually large shell, which has been noted especially by Pilsbry and figured by him.[5] Another lot, collected by two of the authors and F. E. Richard, comes from the south side of the Klamath River at its mouth. The second locality is the ocean bluff near Crescent City, California, from whence comes a lot collected by E. P. and E. M. Chace, and which is about fifteen miles north of the type locality. The third locality, near Lookingglass, Oregon, is about 180 miles to the north of the type locality. The remaining lot is from the beach near Orick, Humboldt Co., California, which is about 20 miles to the south of it. It was collected by Dr. E. C. Van Dyke, July 15, 1931, and consists of 18 adult shells and 10 others not fully mature.

Thus, the known range can be said to extend for about 200 miles on or fairly close to the coast of northern California and southern Oregon, being found farther inland as the more northerly limit of its range is reached.

The type of *H. arrosa mailliardi* Pils. measures: maj. diam. 20.0 mm.; height 15.3 mm. It is slightly larger than average, has 5½ whorls, and is Holotype No. 2646 in the collection of the California Academy of Sciences at San Francisco. Average measurements and ranges in size of the three principal lots afford an interesting comparison and are given in the following table:

	Orick	Requa	Lookingglass
Average shell:			
Maj. diam.	18.9 mm.	19.9 mm.	18.0 mm.
Alt.	14.9 mm.	16.0 mm.	13.2 mm.
Largest shell:			
Maj. diam.	20.8 mm.	21.5 mm.	22.4 mm.
Alt.	16.7 mm.	18.2 mm.	16.9 mm.

[5] Pilsbry. P. A. N. S., vol. 78, p. 483, pl. 38, fig. 15, 1926 [1927].

Smallest shell:			
Maj. diam.	17.5 mm.	17.5 mm.	15.5 mm.
Alt.	12.9 mm.	13.3 mm.	11.5 mm.
Number measured	18	8	16

This variety is the smallest of the *arrosa* group and is unusual for the relatively little variation in size among the specimens so far studied. This is all the more remarkable because of the frequent wide range in size of the "typical" form of *arrosa,* not only among specimens from different localities, but also among specimens in the same lot. The largest *arrosa* so far seen has a major diameter of 40.5 mm., which places it among the biggest of our Pacific Coast land snails. Only a few of the largest of *M. fidelis* (Gray) exceed it in size, and then only by a small margin. The smallest is the Lookingglass specimen indicated in the table (15.5 mm.).

The affinities of *mailliardi* are with *H. a. expansilabris,* which it resembles in general contour only. While it is not at all impossible that intergrades between the two varieties may be found eventually, there are good reasons at present for considering the two as distinct, at least until a thorough study can be made of the entire *arrosa* group based on a large collection of specimens taken throughout its entire range.

DESCRIPTIONS OF SOME LAND SNAILS OF SOUTHWESTERN NORTH CAROLINA

BY WILLIAM J. CLENCH AND GILBERT S. BANKS

The following notes and descriptions of new forms are based upon material obtained during two trips into the mountains of western North Carolina.

The junior author made a trip during August, 1930, in Cherokee, Jackson and Swain counties, North Carolina. In July, 1931, the senior author accompanied by A. F. Archer and Harold Rehder investigated the counties of Cherokee, Clay, Graham, Macon, and Swain. The second trip was made

in part to amplify the material collected on the first trip and to complete a general survey of the state of Georgia started two years ago by the senior author and Dr. P. Okkelberg.

The entire southwestern corner of North Carolina is mountainous. It is drained by several major confluents of the Tennessee River that have cut rather deep gorges through the main axis of the Appalachian Mountains. These major streams (Hiwassee, Little Tennessee, and French Broad) have probably played an important part in isolating various faunal elements that are peculiar to the higher altitudes. As yet, our knowledge is still imperfect relative to the entire mountainous sections of the southern states, though certain localized areas have been more or less intimately studied. The ranges of several species will probably be extended when a thorough and more detailed study can be made of the entire area, and there is no question but that several new forms will be discovered. It is gratifying to know that our governments, both state and federal, have taken over large areas in different parts of this region as state and national forests, and as a consequence much of the original land fauna, especially the invertebrates, will be preserved.

The authors are deeply indebted to Mr. Mack Cooper of Andrews, North Carolina, for use of a fine camp site and for much information about the region investigated.

RETINELLA (GLYPHOGNOMON) JUNALUSKANA, sp. nov.[1] Pl. 2, fig. 4.

Description: Shell minutely umbilicated, possessing the same general outline and thinness of *R. sculptilis* but only a little more than half the size of that species. Whorls 6, upper half of the shell light amber, basal area shading into yellowish horn. Sculpture consisting of axial grooves, with a beaded riblet on each side. The area in between the riblets is faintly and spirally beaded. Incised spiral lines are present on the earliest whorls, the beaded sculpture only well developed on the last two whorls. On the basal area, the grooves and beaded riblets are as equally well developed and continue into the umbilicus.

[1] This subspecies is named for the Indian chief, Junaluska, who had exercised control over the Cherokee Indians of this region.

	Height	Maj. Diam.	Less Diam.	Ap. Width	
M.C.Z.	3.6 mm.	6.5 mm.	6.0 mm.	4.0 mm.	Paratype
	4.0 mm.	7.5 mm.	6.7 mm.	4.6 mm.	Holotype
	3.9 mm.	7.3 mm.	6.6 mm.	4.2 mm.	Paratype
	3.7 mm.	6.6 mm.	6.0 mm.	3.8 mm.	Paratype

Holotype: M. C. Z. 86429. (E. 83° 47′, N. 35° 12′.) Wooded slopes of small hill 2½ miles East of Andrews, Cherokee Co., North Carolina. G. S. Banks, Aug., 1930; Clench, Archer and Rehder, July, 1931, collectors. *Paratypes:* M. C. Z.; ANSP. No. 157215; Univ. of Mich., and collection of G. Banks.

Remarks: This new subspecies differs from *R. sculptilis subdola* Baker in possessing a darker color and having an entirely different sculpture. In *R. s. subdola* there is no trace of beading, the axial grooves are wider, and the spiral sculpture is very strong on the last whorl. (Sculpture characters obtained with Spencer binocular 12.5 eyepiece, 3.4 ocular.)

POLYGYRA (STENOTREMA) VOLUMINOSA, sp. nov. Pl. 2, figs. 6, 7.

Shell imperforate, medium in size, globose, quite thin. Color reddish brown, occasionally albinistic forms are found. Whorls 5⅞, body whorl strongly convex, equally rounded above and below with no trace of a keel. Spire low, very flatly cone shaped; the entire spire slightly convex. Aperture transverse, and nearly straight. Its area materially reduced by the large recurved parietal tooth. Palatal lip entirely free, and not connected with the parietal tooth as in most species in this group. Basal margin of the palatal area with a deep, fairly wide notch. Upper portion of the palatal area is more or less cut back, leaving the lip rather thin at its attachment to the body whorl. This area of the lip bends down sharply, as in other species of this group. Parietal tooth very large, well rounded, and recurved towards the basal area of the lip. It overlaps the insertion of the peristome, producing a pocket at the umbilical depression. It terminates inside of the aperture, just behind the lip margin, when viewed from the side. Within the body whorl, the columellar plate which extends backwards, has on its free

end a recurved area. Suture only slightly depressed. Sculpture consisting of incised axial lines on the nuclear whorls, the remaining whorls covered with numerous somewhat prostrate short hair-like processes.

Height	Maj. Diam.	Less. Diam.	Ap. Width	
9.5 mm.	13.9 mm.	12.8 mm.	7.0 mm.	Holotype
9.2 mm.	13.1 mm.	12.3 mm.	6.9 mm.	Paratype
9.0 mm.	13.9 mm.	12.7 mm.	6.8 mm.	Paratype
9.0 mm.	13.5 mm.	12.4 mm.	6.8 mm.	Paratype
8.9 mm.	12.7 mm.	11.8 mm.	6.5 mm.	Paratype

Holotype: M. C. Z. 82530 (E. 83° 39′, N. 35° 38′), Blowing Springs, Cliff Ridge, Nantahala Gorge, Swain Co., North Carolina. G. Banks, Aug., 1930; Clench, Archer, Rehder, July, 1931, collectors. *Paratypes:* M. C. Z., ANSP. No. 157684, Univ. of Mich., and the collections of A. Archer, G. Banks, and H. Rehder.

Remarks: The profile view of this species is almost identical with *P. brevipila* Clapp, but *P. voluminosa* is much larger, has one more whorl, and the basal notch is distinctly an indentation in the center of the lip. From *P. stenotrema* Fér. our species differs in its larger size, non-angular body whorl, very hirsute surface, and recurved columellar plate.

In relationship it seems to be nearest to *P. brevipila* and both of these forms may have evolved from some common ancestral stock, though they are now separated by about 200 miles of territory.

POLYGYRA (TRIODOPSIS) NANTAHALA, sp. nov. Pl. 2, figs. 1-3 and 5.

Description: Shell 17 to 18 mm. in width, subglobose; imperforate; moderately heavy, translucent. Color, reddish horn, shining. Whorls, 5½, strongly convex, rounded and finely though definitely angular on the body whorl. Spire depressed, rounded or dome shaped. Suture, indented. Aperture, lunate, peristome white, and sharply reflected; on the basal portion of the peristome there is a small tooth, produced by a continuous thickening of the peristome. Nearly one-half of the way along the peristome from the umbilicus, this thickening is sharply cut down, producing this tooth-like structure. Parietal wall supporting a rather long re-

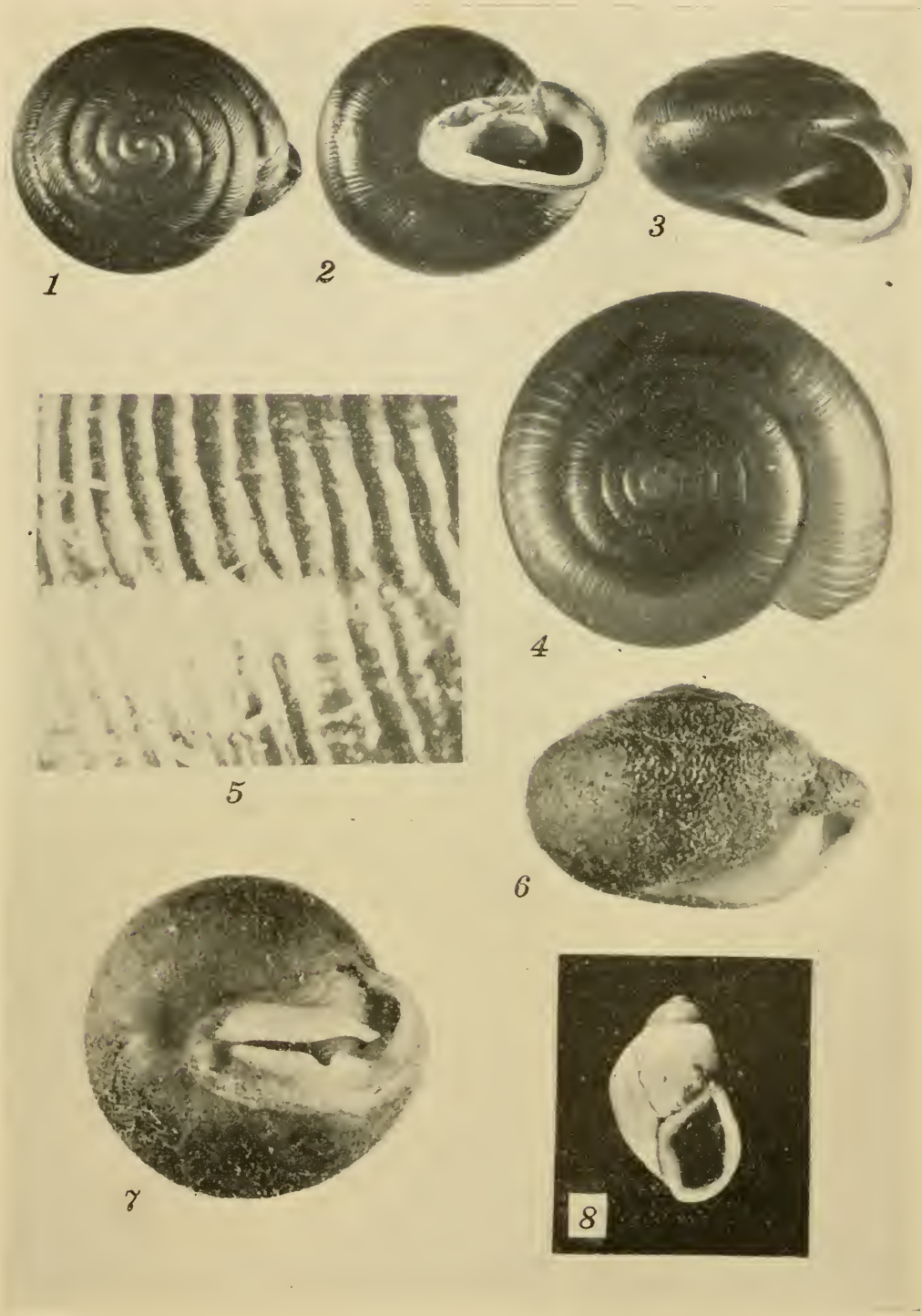
curved tooth, its highest point being directed towards the center of the aperture, its lower point towards the umbilical area. Columella inconspicuous. Sculpture of moderately coarse axial ridges, becoming finer on the earlier whorls but including this same sculptural character on the nuclear whorl. These axial striae cover the entire body whorl from the suture to the umbilical area, but are interrupted at the angle by Y-shaped ridges. Under a lens there are no spiral striae. The under surface of the body whorl is slightly malleated.

Height	Maj. Diam.	Less. Diam.	Ap. Width	
11.0 mm.	17.7 mm.	15.0 mm.	7.3 mm.	Holotype
11.2 mm.	18.2 mm.	16.0 mm.	8.3 mm.	Paratype
11.6 mm.	17.8 mm.	15.2 mm.	Broken	Paratype
11.1 mm.	17.2 mm.	14.7 mm.	7.0 mm.	Paratype
11.6 mm.	17.7 mm.	15.2 mm.	7.5 mm.	Paratype

Holotype: M. C. Z. 86429 (E. 83° 39′, N. 35° 38′), Blowing Springs, Cliff Ridges, Nantahala Gorge, Swain Co., North Carolina. G. Banks, Aug., 1930; Clench, Archer, Rehder, July, 1931, collectors. *Paratypes:* M. C. Z., ANSP. No. 153664, Univ. of Mich., and the collections of A. Archer, G. Banks, and H. Rehder.

Remarks: This species is a member of the group to which belongs *P. elevata* Say, *P. clarkii* Lea, and *P. pennsylvanica* Green. In relationship it is nearest to *P. clarkii,* but differs materially in several of its characters. *P. nantahala* is much larger, and proportionally is not so elevated, and possesses a greater amount of sculpture on the nuclear whorl. The aperture and tooth structures of the two species is similar other than size, though the parietal tooth of *P. nantahala* is proportionally longer.

In addition to the new forms, numerous other shells obtained in this region will be enumerated in the next issue of NAUTILUS.



F. P. Orchard, phot.

1—3. Polygyra nantahala x 2. 4. Retinella janaluskana x 6.
5. Polygyra nantahala, keel sculpture x 12.
6—7. Polygyra voluminosa x 3. 8. Diplomorpha coxi Pease.
All photographed from holotypes.

A NEW MEXICAN ASHMUNELLA

BY H. A. PILSBRY

ASHMUNELLA CARLSBADENSIS, new species.

A cave in Dark Canyon, southwest of Carlsbad, New Mexico. Type 158815, paratypes 158816 ANSP., also in coll. M. C. Z., collected by Mr. E. B. Howard, 4.30.32, from the surface to a depth of two feet.

The shell is umbilicate, the umbilicus contained about 5½ times in diameter of shell; lens shaped, acutely carinate; cinnamon-buff, with little gloss above, the base paler, glossy, subtransparent. Initial 1½ whorls smooth, third whorl with a few weak traces of long granules on the weak striae, last whorl with weak wrinkles of growth and some very weak spiral lines. The fully 5 whorls are moderately convex, the last descending in front. The umbilicus enlarges suddenly in the last whorl, the inner, well-like cavity being much less than half of the final width. The very strongly oblique aperture is irregularly trapezoidal, the white lip reflected, with one tapering, round-topped tooth within the outer margin, two smaller teeth in the basal margin, and a short, straight, oblique tooth on the parietal wall.

Height 5.5 mm., diam. 13 mm.

This species is related to *A. walkeri* Ferriss, of the Florida Mountains, New Mexico, but it differs by the much narrower peristome, with a narrower, tapering tooth in the outer lip, further from the outer basal tooth; a much smaller parietal tooth, a thinner parietal callus, and there is a fraction of a whorl more. Like *A. walkeri* it appears to be a burrowing snail.

VALVATA SIMPLEX GOULD

BY WILLIAM HENRY FLUCK

Among some mollusks collected by the writer in Oneida Lake, N. Y., June 30, 1930, were some *Valvata* different from any I had in my collection. They have fairly rounded and smooth whorls, and exist in vast numbers on the algae and other water weed in the eastern end of the lake, and, no doubt, throughout the whole lake in suitable stations, al-

though F. C. Baker, in his work on Oneida Lake, 1916 and 1918, does not mention this form. He did, however, collect the very strongly carinate form known as *V. tricarinata* Say, as well as *V. bicarinata normalis* Walker and *V. sincera* Say. I sent a few of these Oneida Lake *Valvata* to Dr. Pilsbry for expert diagnosis, and Mr. Vanatta, who looked into the matter, reported as follows: About 20 specimens, no keels, *Valvata simplex* Gould; two specimens, no peripheral keel, *Valvata tricarinata confusa* Walker; two specimens with peripheral keel only, *Valvata tricarinata,* var. not named.

I very carefully examined a vial of these Oneida Lake *Valvata* in my own collection, using a 20 power simple lens, inspecting 326 specimens, in all, and I find they vary from perfectly smooth, rounded forms through all gradations to fairly well carinated specimens. Out of the whole lot of 326, I was able to pick out the following:

1. There were 236 whose rounded whorls showed no trace of actual shoulder, but in some specimens a lighter coloring seemed to show where the shoulder should have been, but neither real carina nor actual shoulder was present. This mollusk is the one called *Valvata tricarinata simplex* Gould.

2. This lot, 51 specimens in all, were similar to the first, except that the base of the shell, where it dips into umbilicus is distinctly angulate or keeled, but not so much as is the case with typical *Valvata tricarinata.* This, apparently, is what is called *Valvata tricarinata infracarinata* Vanatta.

3. A lot of 16 specimens, having a distinctly angulate base, and in addition, with a more or less distinct angulate periphery or a carina, but the upper carina missing. I have not found this form in the literature available to me, but this mutation is, no doubt common enough, and if it has not been called attention to, I should like to suggest that it be called variety *bakeri,* after F. C. Baker. Type No. 169016 ANSP.

4. The next lot, 11 in number, has the angular shoulder above and the basal angle also, but not very outstandingly so, while the periphery is rounded. This is probably what Mr. Vanatta marked *V. t. confusa* Walker, but if it is that form,

it is a little sister to the big specimens I have from the Delaware River at Philadelphia, collected thirty years ago. It is, however, in all likelihood, what Dr. Walker now calls *V. t. perconfusa.*

5. This lot consists of 6 specimens, all of which have, more or less triangular whorls, with discernable shoulders, tending toward carinae, but which I should not consider sufficiently carinate to regard as typical *Valvata tricarinata,* although they form a slight approach toward that species.

6. Four forms out of the whole lot of 326 shells have the three keels so distinct that I will tack up their shingle, with some reserve, as *Valvata tricarinata* (Say), but even these have not the outstanding keels so unfailingly distinct and prominent as I note in hundreds of specimens I have from the Monacacy Creek, at Bethlehem, Pa.

7. Last, a lot of two specimens showing a peripheral shoulder only, indicating where the keel ought to be. This is near to what Mr. Vanatta indicated as an unnamed variety. I take it to be what Baker, 1928, calls *mediocarinata.*

This round-whorled race of Valvata from Oneida Lake is so different from the strongly carinate species that bears the name of *Valvata tricarinata* with its depressed whorls, high carinae like ramparts about a tower, and with flat, squarish trenches between the carinae, that I rather regret that *simplex* is regarded as a variety of *tricarinata,* rather than as a distinct species. The proportion of specimens in this Oneida Lake form of *simplex* that runs to angles and carinae is so small, and the number developing into keels so insignificant, that the prepondering forms having rounded whorls should be regarded as a distinct species bearing the name *Valvata simplex* Gould. The varieties indicated above, could as well be regarded as mutations of *simplex* as of *tricarinata,* and, as I think, with more exactness.

There is no doubt, however about *Valvata tricarinata* Say being found in Oneida Lake. Baker reports it in his work on Oneida Lake, and the present writer found 6 specimens of this species, about which there can be no question, on July 6, 1930. I found no other form of Valvata with them. It is

therefore quite possible that hybridizing goes on between typical *simplex* and typical *tricarinata,* so that all possible mutations or forms or varieties are to be found. I, for one, will regard *Valvata simplex* Gould as a species, variable, of course, as all species are more or less variable, even as the human race is variable. For, if naturalists were to "subspeciesize" the human race as friend Baker has the fresh water mollusca of his tramping ground, we would have not only Homo sapiens auct., but also Homo sapiens villosus and Homo sapiens calvescens, according to whether we are football players or belong with bald heads in the front row.

SOME HABITS OF A CUBAN SNAIL, POLYMITA PICTA BORN

BY E. A. ANDREWS
Johns Hopkins University

Some 54 individuals of the "painted snail" only one to one and a half centimeters in diameter and immature, brought from Cuba by Mr. d'Alte Welch, were kept in a deep glass jar of six liters capacity and with both flat and curved sides, covered but ventilated, kept moist by wet paper toweling, from May to October, 1931, with attempts to feed them upon various fruits and vegetables as well as wood green with pleurococcus, yeast smears, honey, mixtures of precipitated chalk glucose and dextrine, as well as fragments of Florida oolite for source of lime.

Faeces showed no pleurococcus but some other green cells as well as towel paper fibers cut short but not digested, with also some rotifers, ciliata and many nemas, and occasional denticles from the lingual ribbon.

Mortality was great; some contained parasites, others apparently received too scanty food: only five survived into October. However, observations from July 9th to September 6th showed that under the above conditions these snails had certain marked habits both in the jar and also when placed upon trees in the grounds, in Baltimore, Md. The

animals showed but a very limited period of activity each twenty-four hours, moving about for only a few hours, as a rule.

Activity was seen as actual locomotion and inferred from change of position, when not actually under observation. While some few individuals did move about in the night and at all daylight hours, the rule was that no snails moved in the night nor in the daylight period except in the early morning. Conversely while most of the snails were active in the early morning some few were then at rest. The rest period continued on during the night till about five a. m. when activity began and lasted only till about eight a. m. when rest came again.

On different days with temperatures varying from 60-82° F. in the morning and from 68-92° in the afternoon, and with different states of weather, snails became active soon after 4 a. m. rarely, or not till 6 a. m. but generally very near 5 a. m. The return to rest followed 8 a. m. and might not be till 9 or even 10 a. m. Very rarely were any active in late forenoon or night. This matinal activity is perhaps the more striking in its limitation as the contrast is so great between habit and locomotion.

At rest the snail's foot is shrunken till but a very small part of it, as a rounded area of few millimeters extent, remains in contact with the glass or other substrate, nothing showing outside the boundary of the shell, as head and antennae are drawn in; but the foot is not quite the only means of attachment, since there may be a delicate transparent pellicle of secretion stretched from the shell all round about across to the substrate, leaving the foot at the center of this circular attachment.

Thus attached, the snail remains horizontal or vertical, upside down frequently, on most any surface, but not upon the fine wire net that supplied ventilation. Upon a tree the snails rested on the under side of leaflets, or upon stems. Pulled or shaken loose, or when wetted as by rain, such resting snails may quickly pass into active locomotion. Normally from internal conditions they slowly protrude head

and antennae, elongate the foot, and finally move forward, the pellicle disappearing.

The fully active animal travels with speed and great sure-footedness, advancing some three feet in half an hour, its long almost cylindrical foot stretched out to a very fine point behind and its greatly elongated tentacles with large terminal eyes and feelers reaching out far in advance. In this svelte creature the shagreen skin of velvet blackness over foot, head and mantle stands out in pleasing contrast to the shell of creamy white, canary yellow or bright red with longitudinal bands of white and dark; well called the painted snail. Its movements are graceful, rising up from the substratum, the head and forebody may stretch far out in advance till but the hindpart is attached, or the body may arch upward in a long loop leaving but the ends attached. On black locust trees with compound leaves the snail reaching out for side branches and leaves actually passed across large spaces, finding a new leaflet with its anterior end, attaching this end and then drawing itself together till both leaflets were near together and so passing over from one to the other, without hesitation or any falling.

Only when many were on the same suspended stick and climbed upward reaching out laterally, as for side branches, did they ever fall off and then because each crawling out upon others there resulted clumps of five or six all supported by the foot of the undermost, which finally no longer withstood the strain, so that the whole complex fell off.

Their acrobatic skill and adaptedness in climbing was well shown when one climbed up several inches on a silk wrapped wire only .4 mm. in diameter and then turned and came down again without falling from this substrate so much more narrow than its foot width; as if walking a tight rope vertically up and down.

A marked illustration of the climbing ability as well as the strength of the urge to go toward the light shown by *Polymita picta* was seen when one kept alone on an island of stone and bark in a large aquarium 75 cm. by 44 cm. by 42 cm. repeatedly passed off the island across a space of 35 mm.

over water to the glass on the side toward the light.

When observed this snail spent some half hour walking back and forth near the edge of the stone island, occasionally retreating from and coming again to the edge, exploring the air with its eye stalks stretched 16 mm. long, waving them and bending them singly and in unison, but never touching anything solid with them. Finally the animal reached out straight across the narrowest part of the space between stone and glass, 35 mm., and about as much above the water, that made a moat around the island. While the tentacles with eyes did not touch the glass they apparently gave information of its presence till the extreme tip of the end of the foot stretched far enough to touch the glass, to which it adhered, and the animal made an elongated bridge across the chasm with only the last few mm. of body sticking to the stone and supporting the entire weight, horizontally, over to the glass. Then, rapidly the head end of the foot, glided up the glass as the rear end let go from the stone and slowly passed across the space to continue the forward movement up the glass. Crawling thus on glass the animal measured 32 mm. but had stretched itself across a space of 35 mm., while its shell measured but 17 mm. in diameter.

Locomotion seemed often influenced by gravity: resting generally on the lid or upper parts of the jar the snails aroused, went downward and then in all directions, as searching for food, but eventually crawled upward again before coming to rest. On a tree they proceeded several feet upward and outward, but came to rest under some leaflet where they were remarkably inconspicuous and hard to locate in spite of their light colored shells.

While thus apparently alternating in responses to gravity negatively and positively the marked response was toward light: phototropic response. Kept some four meters from the north windows the snails, with some few exceptions, always came to rest on the face of the jar toward the window. Kept in a room with windows open to the east, south and north but near a blank wall on the west, the snails came to rest on the east face and edge of the jar.

More detailed observations made were as follows: sixty-five observations from July 13 to September 6 showed generally most snails on the east and least on the west with often some north and south, yielding such relative counts as N. 6, S. 3, E. 14, W. 3. When the sums of all these counts were taken, they were N. 266, S. 240, E. 430, and W. 169. An average of these readings would be N. 4.09, S. 3.69, E. 6.06, and W. 2.60 and the range was N. (14-0), S. (11-0), E. (17-0) and W. 8-0).

That the light from the north window seemed more effective than that from the south may be referred to the time of day when the snails are active, for as the sun moved to the south the snails went to rest when the north sky was still most brilliantly illuminated.

The response of the snails to light was also evident when an opaque screen was placed all about the jar except on the west side and at a time, 7.30 a. m., when the snails were actively moving about; then at 9.45 fifteen of the twenty-five snails had come to rest on the west side, so usually avoided, while the other ten were scattered about at rest.

Not only in the jar were the snails responsive to light but also when left several days and nights upon a black locust tree. Here they were found resting in the night and in the day except soon after sunrise for a few hours only, when they crawled about over the twigs and leaves. However, a shower even as late as 7.30 p. m. did rouse them into activity just as wetting them in the jar did.

Since the snails became active soon after sunrise some experiments were made to determine if it was the stimulus of oncoming light which was needed to rouse the resting snails. The jar containing the snails was put into an opaque carton with cover and this placed in a closet. When removed the positions of the snails showed that locomotion had taken place in the dark.

Five repeated experiments in July and August showed the following: Kept in complete darkness all night but few of the snails moved before five to six a. m., but then many were active in darkness at seven a. m. Snails in darkness went to

rest from eight to nine a. m. In going to rest in darkness the snails did not show preference for any side of the jar but were scattered about. In darkness snails become geotropic and went down to search about as if for food.

Thus change from darkness to light is not necessary to rouse the snails from rest to activity in the early morning hours but some internal factors seem involved. Did changes in temperature and consequently in saturation of moisture of air bring about matinal resumption of activity? In room constantly open by three windows temperatures changed with those outside, following them, not attaining as high maximum nor as low minimum. Snails aroused when temperatures were rising but they went to rest when temperatures were still rising and remained at rest when temperatures dropped in the evening. Moreover, the time of rousing was not that of lowest temperatures and most saturation. And in the closed carton the moisture conditions probably varied little. May not innate habits of feeding and resting and metabolic rhythms activate rather independent of outside stimuli?

The snails matinal arousing followed the songs of several wild birds welcoming the day. While Allard[1] shows such songs to be responses to the sun about to rise yet he concedes that the actual awakening of these birds takes place before the first morning song. This awakening may be compared with that of the above snails and both referred to the culmination of metabolic rhythms started long prior to the light of today.

AN OVERLOOKED ARCA FROM SOUTHERN CALIFORNIA

BY A. M. STRONG

Dr. Bartsch in the Proc. U. S. National Museum, Vol. 80, Art. 9, p. 2, which has just been received, describes a new species of *Acar* from Southern California, under the name of

[1] Allard, H. A. The first morning song of some birds of Washington, D. C. and its relation to light. American Naturalist LXIV, 1930.

Acar bailyi and takes as type a specimen collected by me. The history of this species is of considerable interest. Some years ago the late C. E. White and myself, while collecting along the coast between Balboa and Laguna, found a colony of small Arcas growing attached to the under side of loose rock partially buried in sandy mud. A few specimens were sent to Dr. Dall for identification which were returned in two lots, one marked young of *A. solida* Sowerby and the other the young of *A. reticulata* Gmelin. As this colony contained specimens in all stages of growth and with much variation in shape it did not seem possible that they could be the young of two species. A much larger set showing the variations was returned to Dr. Dall with the request that he look them over again. He replied that after comparing them with specimens in the Museum from further south he was inclined to think that they represented sexual forms of a dwarf variety of *Arca solida* occurring at the northern limits of the range of the species. As Dr. Dall considered that *Arca gradata* Broderip & Sowerby of the Pacific was the same as *Arca reticulata* Gmelin of the West Indies (Trans. Wagner Inst., vol. 3, pt. 4, p. 629) this probably explains why Dr. Bartsch found the California shells under the different names. After the discovery of the habitat of this species, other colonies were located at various places between Laguna and San Diego and the shells have been distributed under the name of *Arca solida* Sowerby.

Unfortunately there seems to be an older name than that given by Dr. Bartsch for the California shell. Carpenter in the Proc. Zool. Soc., 1856, p. 202, described *Byssoarca pernoides* of which the type was a single valve from San Diego. This name seems to have been entirely overlooked in the California records. A free translation of Carpenter's description is as follows: "Shell subquadrate, small, white, covered with a brown spongy epidermis; with fine, very close, minutely tuberculate, radiating striae; umbos obtuse, situated anteriorly, cardinal areas small; within a much curved line of teeth, end teeth strong, nearer the center smaller, crowded, squarish; muscle scars rounded, polished,

portion included within the pallial line radiately striated; margins plain; ligamental grooves small, squarish, situated close together, not toothed, areas almost touching. Long. .68, lat. .53, alt. .32. Hab. San Diego (Dr. Wood). One valve in the Gould collection." To this Carpenter adds the note in English, "Somewhat resembling the fine variety of *B. solida* but squarer and known at once by the teeth and ligament. This is (under the glass) in minute pits, as in Isognomon but with an extra layer covering the whole area."

This description fits the shell in question and although the type is not available for comparison, the fact that there is but one species of *Acar* known from this locality makes it almost certain that it represents this species. If this California shell is to be considered as a distinct species (and the difference in size, sculpture and habitat makes this seem reasonable), it is fairly certain that all California records of *A. solida, A. gradata* and *A. reticulata* have been based on specimens which should take Carpenter's name *A. pernoides.* The older names should be restricted to a more southern fauna and stricken from the California lists.

STUDIES ON SNAILS OF THE GENUS PLEUROCERA
I. THE EGGS AND EGG LAYING HABITS

BY HARLEY J. VAN CLEAVE

Until very recently, the life histories of members of the peculiarly American family of snails, the Pleuroceridae, have been almost wholly unknown. Mrs. Jewell, working in the writer's laboratory, discovered the eggs of *Goniobasis* and has described the eggs and newly hatched young in THE NAUTILUS (Vol. 44, pp. 115-119), but the eggs of *Pleurocera* have never been recorded or described in the literature. For several years the writer has been making a study of the life cycle of members of the genus *Pleurocera.* The object of the present report is to give a brief description of the eggs and

of the egg laying habits of two species which occur in central Illinois.

Specimens from two different habitats have been studied. Typical specimens of *Pleurocera acuta* occur in abundance in certain stations of the Sangamon River above Mahomet, Illinois, where field observations have been conducted regularly for two years. Other specimens of this genus from the Illinois River near Peoria, Illinois, were sent to Mr. Calvin Goodrich by Mr. Frank C. Baker who identified them as *Pleurocera lewisii* (Lea).

The eggs of *Pleurocera* were first observed on March 5, 1931, in a tank at the Shedd Aquarium, Chicago, Illinois. Mr. Fred G. Orsinger called the writer's attention to the eggs when he asked for an identification of snails sent to him from the Illinois River by Mr. F. D. Hunt of the Illinois State Natural History Survey. A large quantity of *Pleurocera lewisii* had been kept in a balanced aquarium in a warm room since late in February. On March 5, the sides of the aquarium contained numerous minute masses of small eggs. Since no other snails were present the eggs were assumed to belong to *Pleurocera,* an assumption which later observations on the egg laying habit substantiated fully.

Each mass contained from three to fifteen eggs, with seven and eight the most frequent complements. The eggs were disposed in a single layer, tightly compacted, and with a rather tough gelatinous membrane holding the mass together. Superficially, the larger masses more closely resembled the egg masses of *Helisoma* than of other snails with which the writer is acquainted. Every egg was surrounded by an almost spherical capsule with a diameter of about 0.38 mm. At the time of discovery, the eggs and groups of cleavage cells (pl. 1, figs. 1 and 2) inside the capsules had an average diameter of about 0.285 mm.

In small clutches, the eggs showed a tendency to form in double rows (fig. 1). In larger groups (fig. 2) they formed a circular mass, usually consisting of a central egg surrounded by a single file of six or seven eggs, though in some of the largest masses the arrangement was roughly spiral.

Even in the largest clusters the eggs never occurred in more than one layer in thickness.

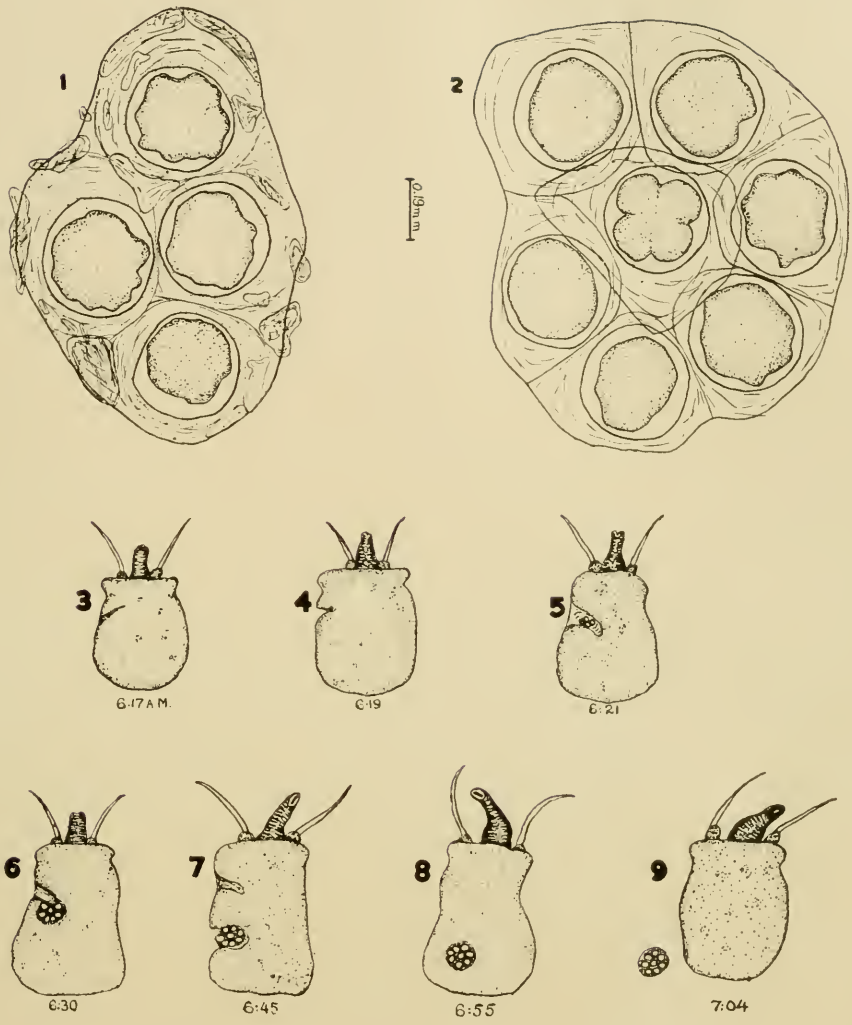
Eggs of *Pleurocera lewisii* scraped from the sides of the aquarium mentioned above, and eggs later produced by some of the same snails which were transferred to a balanced aquarium at Urbana, Illinois, failed to undergo complete development in the laboratory, hence information on the period of development and on the young snails at birth could not be obtained from the laboratory study.

The process of egg laying was observed a number of times and in each instance followed such a uniform series of steps that it is here described in the belief that it is characteristic of the species. Specimens of *Pleurocera lewisii* from the Illinois River which had been kept in aquaria for more than a month continued to lay eggs under highly variable conditions and only those in balanced aquaria and jars with sand covering the bottom were found to produce eggs. Snails that had been kept in the laboratory for some time began to lay eggs about March first and continued to produce eggs for a period of about six weeks. In some of the small aquaria with small numbers of snails, four or five egg masses per day were the average for each female. Under conditions of nature, eggs of *Pleurocera acuta* were not found in the field until April 11, 1931.

On April 2, an aquarium in which numerous *Pleurocera lewisii* egg masses had been recently deposited was placed under close observation and the entire process of egg laying was observed. A specimen which had been actively moving about over the sides of the aquarium became immovably fixed in position and the tentacles and proboscis ceased their exploratory movements. A slight streak of color somewhat darker than the surrounding tissue (fig. 3) was noted on the right side of the foot, near its anterior end, while the foot was tightly pressed against the glass side of the aquarium. In less than one minute after this streak was observed, a very small indentation (fig. 4) made its appearance at the edge of the foot, in the position of the dark streak mentioned above. As this marginal notch or sinus deepened, rhythmic,

pulsating movements were observed in the tissues which were exposed by the opening of the sinus. These movements became more and more conspicuous and seemed to be restricted to a delicate tissue of light gray color which moved by a succession of peristaltic waves until it came down into contact with the glass upon which the foot rested. This highly plastic tube had the appearance of an everted or prolapsed uterus. Almost immediately after the tube came into contact with the surface of the glass, a single egg made its appearance at the opening of the tube, surrounded by minute grains of sand. Sand grains, which had previously been observed more or less covering the eggs of *Pleurocera,* had been thought to be accidental, foreign substance adhering to the masses. The association of the sand grains with the eggs as they issued from the female orifice and the fact that snails kept in aquaria without sand refused to lay, offer evidence that presence of sand on the egg masses is not accidental but may have some particular biological or physiological significance. After the first egg made its appearance at the mouth of the uterus, seven more eggs descended the tube in rapid succession (fig. 5) and took orderly arrangement at its mouth. The completed egg mass was in the form of a circular disc consisting of a central egg surrounded by a circle of seven others, similar to the cluster shown in figure 2. However, the eggs were not deposited in a string as might be inferred from their arrangement. The two eggs at the posterior margin of the mass were discharged first. Anterior to these, a transverse line of three took position in rapid succession, two more eggs were added at the anterior margin of the mass and finally a single egg on the anterior margin completed the complement of eight eggs. From the time the first egg made its appearance until the mass was completed occupied a few seconds less than two minutes. The circular form of the mass was very obviously due to mechanical adjustment of surface relations after the eggs left the uterus.

When the egg mass was completed, an imperceptible movement of the foot slowly shifted the genital sinus (fig. 6) to a



Figs. 1 and 2. Camera lucida drawings of typical egg masses of *Pleurocera lewisii* produced by Illinois River specimens removed to an aquarium. In Fig. 1, part of the foreign material surrounding the gelatin mass is shown. All foreign material is omitted in Fig 2.

Figs. 3 to 9. Series of free-hand sketches showing ventral surface of body of *Pleurocera lewisii* during egg laying. Aquarium specimens from Illinois River.

position anterior to the egg mass. For about ten minutes, the mass lay pressed between the flattened surface of the foot and the glass. The body of the snail was perfectly motionless for about twenty-five minutes from the time eggs began to be discharged. At the termination of this time the right margin of the foot near its posterior extremity withdrew from its former position overlying the eggs and formed a second sinus within which the egg mass rested (fig. 7). The first active movements following the period of inaction were performed by the proboscis. Soon after the proboscis and its mouth became active, the genital sinus on the foot began to close. At about the same time, the posterior sinus surrounding the egg mass was obliterated and the mass lay for a period of about five minutes between the expanded surface of the foot and the glass (fig. 8). Specimens had been observed in this final position so frequently during the course of earlier observations that it was assumed that the genital opening must be borne at the right posterior margin of the foot. Only after the full process of egg laying had been observed was this assumption discarded. The two periods of compression of the eggs against the substrate give characteristic form to the mass and assure firm fixation. The total time required for the egg laying process under laboratory conditions was approximately forty-five minutes.

On April 11, 1931, specimens of *Pleurocera acuta* were observed in their natural habitat, crawling over stones and leaves in riffles of the Sangamon River, near Mahomet, Illinois. A very close scrutiny with a hand lens revealed minute egg masses in great profusion. These masses were covered with a coating of fine sand grains so that their nature was not easily recognized. In fact, the clumps of sand grains had much the appearance of insect cases. The masses were extremely abundant on rocks and pebbles in shallow water and on oak leaves which had been caught and held stationary in the drift material.

Living snails from the Sangamon River were brought to Urbana on April 11 for laboratory observation. As mentioned earlier in this paper, those placed in aquaria lacking

sand laid no eggs while those in containers with sand over the bottom began to deposit eggs in less than twenty-four hours after their removal to the aquarium.

The egg masses of *Pleurocera acuta* from the Sangamon River were fairly consistently different from those of *Pleurocera lewisii* from the Illinois River. They are conspicuously encased in sand grains and most frequently contain four or five eggs while those of *Pleurocera lewisii* from the Illinois River are sparsely sanded, flatter, and contain on the average seven or eight eggs.

To the present time, the writer has been unable to secure the full development of the eggs of either species of *Pleurocera* under laboratory conditions. Very minute young have been taken from leaves and stones in the natural habitat. A study of the life history of *Pleurocera acuta* based upon field observations and analysis of periodic quantitative collections is in progress.

TRUMAN HEMINWAY ALDRICH

In the death of Truman H. Aldrich which occurred at Birmingham, Ala., April 28, 1932, the country has lost a prominent paleontologist and mining engineer. Dr. Aldrich was born at Palmyra, N. Y., October 17, 1848. He attended the public schools of Palmyra, the Military Academy, West Chester, Pa., and the Van Rensselaer Polytechnic Institute, Troy, N. Y., graduating from the latter as a mining engineer in 1869.

After practicing his profession for two years in New York, Dr. Aldrich went to Alabama and in 1873 commenced to develop the coal and iron mines of that state, later becoming the General Manager of the Tennessee Coal, Iron and Railroad Company. In 1894 he was elected to Congress, and as our mutual friend Professor G. D. Harris said at the time, "was the first paleontologist in Congress since the days of Thomas Jefferson". For a number of years he was associated with the late Dr. Eugene A. Smith, State Geologist,

and became interested in Tertiary fossils. In recognition of his service to the State and University of Alabama in geological research, the university conferred on him the honorary degree of Doctor of Science.

Aside from his great work in developing the industrial resources of the state, he described over 200 species of Tertiary shells. These were described in the Journal of the Cincinnati Society of Natural History, 1887, Report of the Geological Survey of Alabama, 1894, Bulletin of American Paleontology, Vol. I, 1895, and Vol. II, 1897, and THE NAUTILUS, 1890-1926. He also described a number of land shells from Sumatra and Borneo, collected by that noted collector William Doherty.

Dr. Aldrich possessed in an unusual degree the ability to master both business and science. My correspondence with him was always both pleasant and helpful. In a letter he wrote when I came to Boston in 1903, he said, "I am sorry to have you go to Boston, you are getting too far away from the Tertiary". To those who have had the pleasure of knowing him personally his friendship will be a lasting memory. There is a picture of Dr. Aldrich in THE NAUTILUS, Vol. 31, p. 37, 1917, in a group of conchologists taken in Washington, D. C., and another in the group of members of the American Malacological Union that appeared in THE NAUTILUS, Vol. 45, p. 1, 1931.

C. W. JOHNSON.

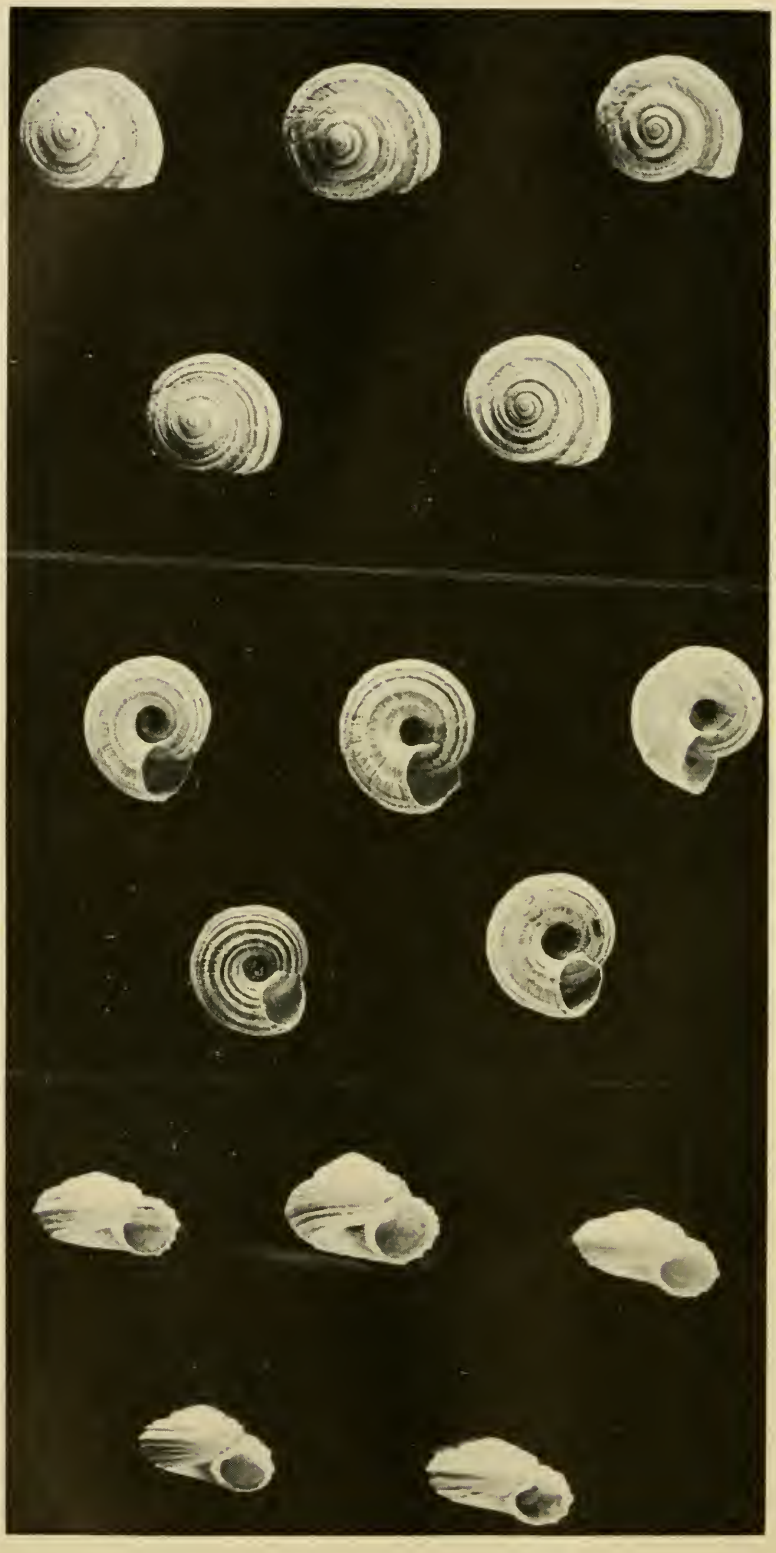
NOTES AND NEWS

CRESS A POSSIBLE INTRODUCER OF SPECIES.—A living specimen of *Goniobasis carinifera* (Lam.) was found recently upon water cress that was being washed in my household. Cress is shipped to Ann Arbor from Chicago in paper cartons and moistened only sufficiently to keep the material fresh. This particular shipment, of course, originated in the south. In northwestern Georgia in 1930, Mr. Henry Vander Schalie and I stopped to collect mollusks at a large

spring which was ponded on both sides of a road eight miles south of Rome, Floyd County. The shells were all *G. carinifera* and, as is usual with the species, were very plentiful. We became engrossed in watching a family of king rails that was swimming about in one of the ponds and indicating none of the familiar wariness of this bird. The attention of the proprietor of the spring being attracted to us, he came out to exercise the friendliness of the region. He explained that he was growing water cress for northern markets and had in the season sold $3,000 worth. Rather plaintively, he inquired if anything could be done to check the multiplication of the snails. They were a nuisance to him because their hard shells broke the teeth of saws with which his crop is harvested. Instances of artificial transport of Goniobases by which they might be introduced into new drainage systems appear to be rare. I can cite only the case of *Goniobasis livescens* (Menke), a middle western species, which has crossed into the basin of Hudson River by way of the Erie Canal. Mr. Frank C. Baker, Fresh Water Mollusca of Wisconsin, Pt. I, p. 136, mentions that *Stimpsonia nickliniana* (Lea) occurs on commercial water cress. I presume he means cress sold in Illinois. The plant, as it occurs in central Michigan, is a source of *Physa* and *Lymnaea* frequently and *Amnicola* occasionally for collectors.—CALVIN GOODRICH.

One sometimes comes upon new data in the least likely places. Thus, in Mr. William Beebe's article "Snail Folk" in *Nature Magazine* for April, a Bermudian *Natica canrena* is seen (p. 209) on a crag eating a limpet. Probably Mr. Beebe is the only man who ever saw this strange behavior. I have never seen a bored limpet, or a *Natica* climbing the rocks for its prey. And what species is the limpet? The choice is limited in Bermuda, and it will be interesting to heart what species the abundant *Acmaea* or *Patella* shown on p. 211 is.—H. A. P.

The name *Epitonium strongi* being preoccupied, the species described in THE NAUTILUS, XLV, p. 115 is to be called *E. strongianum*.—H. N. LOWE.



Berry: Oneohelix haydeni

THE NAUTILUS.

Vol. XLVI OCTOBER, 1932. No. 2

CHARLES WILLISTON JOHNSON

1863—1932

We have to announce the death on July 19th of the Associate Editor and Business Manager of THE NAUTILUS since its second year, 1890.

Johnson's broad knowledge of living and Tertiary mollusks as well as of insects, was always at the disposal of his associates and scientific correspondents. His friendly and helpful disposition, especially towards beginners or young conchologists and entomologists, endeared him to a large circle of naturalists. We have lost a friend whose place in our hearts cannot be filled. An account of his life and zoological work will be given in a later issue.

Dr. Horace Burrington Baker, of the University of Pennsylvania, will coöperate hereafter in the publication of THE NAUTILUS.

THE TRUE POSITION OF BRUGIÈRE'S BULIMUS CARINATUS

BY CALVIN GOODRICH

Conrad[1] appears to have been the first author to attach the generic name *Anculotus* (restored to *Anculosa* soon after) to a member of the group of *Anculosa carinata* (Bruguière). Say considered his *dissimilis* to be a *Paludina* and his *trilineata* a *Melania*. Beginning with Lea's *Anculosa carinata,* April, 1841, which is identical with Bruguière's species, all newly described members of the group were made *Anculosa, Anculotus* or *Leptoxis.*

In studying the dentition of the Pleurocerids I have found that, in most instances, the radulae are exceedingly alike. There is, indeed, no striking differences between the radulae of such genera as *Goniobasis* and *Lithasia* and those of Japanese species of *Melanoides*—the only foreign Melanians specimens of which I have been fortunate enough to find soft parts. But in *Anculosa* and the closely allied *Eurycaelon* the lateral teeth have an individuality that distinguishes them clearly from the laterals of other genera. These are characterized by a broad, cleaver-like fold or reflection, none to three denticles and a comparatively short peduncle. There is nothing elsewhere among the *Pleuroceridae* quite similar. This was shown by Troschel, whose figures were reproduced by Tryon,[2] but it has apparently attracted no attention. I have examined twenty-four radulae of *A. praerosa* from seven fairly wide-spread localities, eighteen of *subglobosa* from four localities, seven of *umbilicata* from two localities and two of *griffithiana* from one locality. The centrals varied from 2+1+2 to 6+1+6, with considerable variation within each radula. The extreme number of denticles of the inner marginal teeth were six. The cusps of the outer marginals were from ten to fourteen. In all of them, the lateral teeth were alike when in place in the ribbons.

---

[1] New Fresh Water Shells of the United States, 1834, pp. 61, 64; pl. 8, figs. 16 and 17.

[2] American Journal of Conchology, 11, 1866, p. 134.

In the case of *carinata,* the large fold of the lateral teeth is much smaller than that of *Anculosa.* It is oblong or nearly square in shape. The denticles associated with it are relatively large and number from one to four. The peduncle is longer and more slender than in *Anculosa.* The radula as a whole is shorter. Sixteen radulae of *carinata* were examined, four of *dilatata,* three of *virgata,* one of *ornata* and one of *trilineata.* Radulae of no other species of the group were available for study. Centrals in *carinata* were found to be from 2+1+4 to 5+1+5. Those in *dilatata* were 3+1+3, which seems to be the conventional arrangement in most Pleurocerids. In *ornata,* the centrals were 3+1+2 to 3+1+4; in *virgata* 2+1+4 to 5+1+5; in *trilineata* 2+1+2 to 4+1+4. The inner marginals of *carinata* and *dilatata* have six denticles, occasional teeth having eight. As this dimorphism—if it is this and not a matter of difference in age—is characteristic of the forms of *Lithasia obovata* (Say) there is a hint here perhaps of close relationship. The inner marginals of *virgata, ornata* and *trilineata* have six cusps. The outer marginals of the radulae of all these species vary in having ten cusps as in *dilatata* to as many as sixteen that were counted in *trilineata.*

In 1921,[3] I made two groups of these mollusks. In the light of material taken since then and examined, I am sure there is only one natural group of them. Also some species were recognized in 1921 that properly belong to the synonymy. For example, shells that were collected by Dr. A. E. Ortmann made it plain that *corpulenta* Anthony was merely a stout form occurring within colonies of typical *carinata.* The same thing can be reported for *canalifera* Haldeman. Smooth or multicarinate, each form has the same kind of radula. *Costata* Anthony has proved to occur on the same stones or reefs with *trilineata* at the type locality of the latter. Connecting links between them were plentiful. Possibly a long series of *arkansasensis* Hinkley might confirm the integrity of this species, but specimens that were sent to me by Hink-

[3] Nautilus, XXXV, 1921, pp. 9, 10.

ley cannot be differentiated from *trilineata* of the Ohio River without straining of imagination.

On the third page of the cover of Number 3 of "A Monograph of the Limniades or Freshwater Univalve Shells," July, 1841, Haldeman wrote down *Mudalia* as a subgenus for his *Anculosa affinis*. In the way of description for the species he gave only these few words: "I propose this name for a shell allied to 'Paludina dissimilis,' Say, but which differs from it in having a slight tooth upon the columella. Hab. Ohio, Mrs. Say." Tryon considered the diagnosis insufficient, and the figure he gives of the shell looks like *Lithasia obovata* (Say). Ohio, of course, would be outside the territory of anything closely resembling *dissimilis*, though all right for *obovata*. *Mudalia*, therefore, seems to be unavailable as a generic name for the *carinata* group. The next name proposed was *Nitocris* H. & A. Adams, "The Genera of Recent Mollusca," part XXV, March, 1856, p. 308. Of the twelve species listed under *Nitocris* by these authors, only one, *ebena* Lea, does not belong in this place.

A REDEFINITION OF POLYGYRA ALBOLABRIS MAJOR

BY ALLAN F. ARCHER

Polygyra albolabris major (Binn.) is a form the identity of which is still hazy in the minds of many conchologists. The usual conception of this form is that it is a large variety of *Polygryra albolabris* (Say). An examination of a large series of specimens in the collection of the Museum of Comparative Zoology, Cambridge, Mass., shows that size should not be a test in defining this form. Some very large specimens of *P. albolabris* have been collected in eastern Tennessee and southeastern Kentucky and have been considered by several writers to be *P. albolabris major*. In the Proceedings of the Academy of Natural Sciences of Philadelphia, 1900, p. 120, Dr. Pilsbry in his article on the Mollusca of the Great Smoky Mountains expresses some doubt as to whether the large forms of eastern Tennessee can be rightly considered

as *major*. A series of *albolabris* from Scott Co., Virginia, includes several very large specimens, the largest having a diameter of 41 mm. This exceeds a great many Georgia specimens in measurement. Accordingly if size were the test this series would deserve to be included as *major* and not *albolabris*.

It is now becoming increasingly apparent that size is not a good test for determining North American *Polygyrae*. The best example of that fact is *Polygyra thyroidus* Say which varies greatly in size in certain localities. Therefore it is necessary to find other more permanent means of differentiating these two forms. The clue to the situation is to be found in Binney's description of *major*. Binney first noticed this form in series obtained by him from Georgia. On the basis of that material he described *major*. Later on in his *Land* and *Fresh Water Shells* of *North America, Smiths. Misc. Coll.*, Feb., 1869, he included Tennessee, Alabama, Florida, and South Carolina as habitats of *major*. Whether or not he was justified in considering it as a species distinct from *albolabris* is a matter of opinion. However, further anatomical material may be necessary to settle that point. Specimens of *major* from Georgia can be considered to be typical and therefore are a good basis for establishing its characteristics. There are two characters by which major may be readily distinguished from *albolabris*.

1. Sculpture

P. major	*P. albolabris*
Axial striae crowded and fold-like. Spiral lines almost absent or completely obsolete.	Axial striae not crowded and broader. Spiral lines always present and very definite, cutting rather deeply across the axial striae; closely crowded.

2. Aperture

Peristome narrow, thickened, rounded, with blunt not very expanded or sharp edge. Even in the case of submature specimens, the peristome though thin is quite narrow.	Peristome wide, thinner, flatter, with sharp and more reflected edge.

The parietal wall of adult specimens of *major* is covered with a thick callus which seldom occurs even in the largest and heaviest specimens of *albolabris*. The inner margin of the peristome of *major* always possesses a tooth-like process, but this equally occurs in many specimens of *albolabris* particularly from eastern Tennessee and southwestern Virginia. Some specimens of *major* are very globose, particularly examples from Whitfield and Walker Counties, Georgia. Others are fully as depressed or subglobose as typical *albolabris*. Examples of this latter type are too numerous to mention.

Reddish-horn color or chestnut is the usual color of *major*, but in this character it differs not at all from many *albolabris*. A few specimens from Habersham Co., Georgia are rather lighter than the normal. The peristome is a definite white contrasting thus with the rest of the shell.

The range of *major* extends from coastal North Carolina to Alabama. It is found in coastal South Carolina, central and coastal Georgia, northern Florida. *Major* is found all over Georgia even in the mountainous country of the northwest where it overlaps *Polygyra normalis* Pils. in range. The evidence at hand seems to indicate that it does not get into the mountains of South Carolina, but is there replaced by *P. normalis*. It is found in eastern Alabama but seldom attains the size of some examples from Georgia. It overlaps *P. albolabris fuscolabris* Pils. in range.

The range of *albolabris* is wide, being found in Canada east of the Rocky Mountains, and chiefly east of the Mississippi River in the United States. The typical form is found throughout this area as far south as coastal North Carolina and in the Mississippi valley as far south as Kentucky. In southwestern Virginia a typical form appears. In that region it is very large, thick-lipped and often darker than typical *albolabris*. It is absent in the mountainous area of western North Carolina except on the very western edge of the Roan mountain region. There a large rather globose form, light in color but with a pinkish spire is prevalent. It also occurs in eastern Tennessee. The area lying between eastern Tennessee and the Mississippi River is characterized

by yet another form of *albolabris*. It is depressed with a very flat broad base. This form is found throughout most of Kentucky.

Polygyra albolabris alleni Wetherby occurs chiefly west of the Mississippi where the range of *albolabris* practically ceases. Mr. C. N. Wettengel has found specimens of this at Hamilton, Illinois. This is one of the few known instances of its occurrence in that area. The possible explanation of this may be due to a change in the river bed. *P. a. alleni* is a readily distinguishable form.

MOLLUSKS AND BARNACLES FROM MALPELO AND COCOS ISLANDS

LEO GEORGE HERTLEIN

Malpelo Island is a rugged, barren mass of rock about a mile long, in the Pacific Ocean southwest of Panama City and about 250 miles west of the mouth of the San Juan River in Colombia. It lies in latitude 4° 03′ N., longitude 81° 36′ W., and appears to be composed wholly of volcanic rock. It was noticed by Colnett in July, 1793, and was probably sighted by other early navigators. Politically, Malpelo belongs to Colombia. Slevin[1] included a photograph of it in a paper published in 1928.

In December, 1931, Mr. C. B. Perkins, herpetologist, of Denver, Colorado, landed on the island and spent about an hour, collecting for the San Diego Zoological Society. This was accomplished during an expedition to the Galapagos Islands on Captain G. Allan Hancock's yacht *Velero III*.

Mr. Perkins collected on the island, a number of lizards, belonging to the species *Celestus hancocki* Slevin. He also secured two species of marine gastropods and one species of barnacle. These he presented to the writer and they are now in the collections of the California Academy of Sciences. The

[1] Slevin, J. R., Description of a new species of lizard from Malpelo Island. Proc. Calif. Acad. Sci., Ser. 4, vol. 16, No. 21, pp. 681-684, plates 25 and 26, February 28, 1928.

species are: *Acanthina brevidentata* Wood, *Thais patula* Linnaeus, *Tetraclita squamosa milleporosa* Pilsbry. These species also occur on the coast of Panama.

Cocos Island lies in latitude 5° 32′ 57″ N., and longitude 86° 59′ 17″ W. It was known to Wafer, Dampier and other early navigators. Politically it belongs to Costa Rica. It is at least for the most part, composed of volcanic agglomerate and other volcanic rock and is about 13 miles in circumference. The island was visited in February, 1932, on the return voyage of the *Velero III* from the Galapagos Islands. Here the writer collected marine mollusks at Wafer Bay and at Chatham Bay. Dr. G. D. Hanna kindly assisted in the determination of certain of the species.

Dall[2] has already mentioned the occurrence on the island of *Siphonaria gigas* Sowerby, *Melampus panamensis* C. B. Adams, *Octopus pusillus* Gould, *Octopus januarii* Hoyle, *Symplectoteuthis oualaniensis* Lesson and *Placiphorella blainvillei* Broderip.

The present faunal list is incomplete but it indicates that, with one exception, the marine mollusks from Cocos Island are similar to those from the mainland of Central America. *Cypraea moneta* Linnaeus is apparently not recorded from the coast of the mainland, but it occurs at the Galapagos Islands as well as in the South Seas.

Schmidt[3] has given a discussion of the zoogeography of Cocos Island and Slevin[4] included an excellent and interesting description in his report.

---

[2] Dall, W. H., Proc. Acad. Nat. Sci. Philadelphia, vol. 48, Sept., 1896, pp. 452-453; Proc. Acad. Nat. Sci. Philadelphia, vol. 52, 1900, p. 97; Proc. U. S. Nat. Mus., vol. 37, 1909, pp. 194, 195, 205, 246.

[3] Schmidt, K. P., (Essay on the Zoogeography of the Pacific Islands). In Shurcliff, S. N., Jungle Islands, Putnam Press, New York, 1930, ap. pp. 278-280.

[4] Slevin, J. R., Log of the Schooner "Academy" on a Voyage of Scientific Research to the Galapagos Islands, 1905-1906, Occasional Papers Calif. Acad. Sci., No. 17, 1931, pp. 28-32, plate 2.

The following species were collected at Chatham Bay:

Cerithium adustum Kiener[5]
Conus dalli Stearns
Cymatium vestitum Hinds
Fissurella virescens Sowerby
Latirus tuberculatus Broderip
Nerita bernhardi Reclus
Thais crassa Blainville

The following species were secured at Wafer Bay:

Acmaea (Collisella) aeruginosa Middendorff
Acanthina brevidentata Wood
Cantharus gemmatus Reeve
Conus tiaratus Broderip
Cypraea moneta Linnaeus
Fissurella virescens Sowerby
Harpa crenata Swainson
Hipponix cf. *grayanus* Menke
Littorina aspersa Philippi
Littorina conspersa Philippi
Nerita bernhardi Reclus
Nerita scabricosta var. *ornata* Sowerby
Neritina pilsbryi Tryon[6]
Ostrea callichroa Hanley
Ostrea palmula Carpenter
Pedalion chemnitzianum d'Orbigny
Planaxis planicostatum Sowerby
Siphonaria gigas Sowerby
Siphonaria gigas var. *characteristica* Reeve
Thais crassa Blainville
Thais biserialis Blainville
Thais columellaris Lamarck
Thais patula Linnaeus
Tetraclita squamosa milleporosa Pilsbry

LIMPETS BORED BY NATICA?

BY WM. B. MARSHALL

In THE NAUTILUS for July in a note on William Beebe's "Snail Folk" (Nature Magazine for April), which shows the Bermudian *Natica canrena* on a crag eating a limpet, Pilsbry says, "I have never seen a bored limpet or a *Natica* climb the rocks for its prey."

[5] Mr. A. M. Strong kindly pointed out to the writer, that the figures, 2 and 3, on Kiener's plate 13, are apparently reversed. The form recorded here from Cocos Island, is the smooth one described by Kiener as *adustum* but indicated as *maculosum* on the plate.

[6] The specimens referred to this species in the present collection might be referred to *N. latissima* Sowerby, but since they have somewhat less developed elongations on the aperture and a light purplish colored shell they are referred to Tryon's species. The specimens were collected in the creek at Wafer Bay, about 50 meters from the beach.

This statement aroused my curiosity, for although I have been handling limpets for forty-five years or more, I have never thought to look whether any of them were bored by other mollusks seeking to eat the animal. Recently I have examined great numbers of limpet shells and have been unable to find one that was bored by a predacious mollusk. Some boring bivalves do bore into some of the largest limpets for domicile, but not for the purpose of eating the animal. As Pilsbry and I are the only two who have expressed an opinion on the eating of the limpet and the opinion has been in the negative, the evidence at hand seems to be one hundred per cent. opposed to Beebe's statement. As no bored limpets have been found (so far as I know) the conclusion seems to be that there is something about a limpet that makes it unpalatable or otherwise unsatisfactory to predacious mollusks seeking food.

It may be that the limpet referred to by Beebe is one of the keyhole limpets, namely, *Fissurella barbadensis* Gmelin, but if he intended to indicate this animal he should not have said limpet, but should have said keyhole limpet. So far as I know, the plain name limpet is never applied to the perforated shells, but is always accompanied by the classifying word "keyhole", but the keyhole limpet may afford Mr. Beebe a way out of what appears to be a rather embarrassing position, and yet I can hardly believe that it will afford him a fairly satisfactory exit from the stage, because, as Pilsbry and I apparently have shown the limpet is unsatisfactory food to other mollusks and therefore because of a general similarity between the limpets and the keyhole limpets we are more or less justified in thinking that the keyhole limpet is just as unsatisfactory as the limpet. Furthermore, it seems that nature would attend to her business better than to put a hole in the shell of the keyhole limpet through which a preying mollusk could rob the bank without doing a tap of work in boring through the safe. Finally, I may say that I examined great numbers of keyhole limpets to see if any of them had been bored, and I was unable to find a single specimen that showed a boring or even the beginning of a boring.

The picture in Beebe's article on page 211 shows a large "limpet" at the middle of the "crag". This particular figure is a better illustration of a keyhole limpet than many of the pictures in early scientific publications. The keyhole seems to be perfectly clear there. The picture used on that page and the picture on page 209 showing the moon snail eating a "limpet" are very misleading. Until one concentrates his attention upon size, the "crags" seem to be very high and massive, but when he applies his knowledge of the size of the *Natica* and the ordinary "limpets" he sees at once that the crag is just a small stone and that the snails are only a couple of inches above the surface of the water.

The limpets look as though they might be a titbit for the boring mollusks because they appear dainty, and many of them have shells that are very thin and could be bored with a few movements of the file, and they are very slow of motion, so that the boring robber while at work would not be troubled in staying astride of his mount. It would pay Mr. Beebe to submit for identification specimens of the limpet which he saw being bored. I may say that Mr. Beebe's article is not wasted, whether he states fact or fiction, because, as I have said above, it has been the means of directing my attention to the improbability of boring in limpets or in keyhole limpets. If Beebe had stated a well known fact, that would have been the end of it, because every one would have known the fact already; but when he makes a statement that appears doubtful or fictional it calls forth replies from others who have been compelled to look up data which may have escaped their attention for many years. So, supposing him to be in error, we may say, blessed are the uses of error.

A NEW RACE OF POLYGYRA APPRESSA FROM ILLINOIS

BY FRANK C. BAKER[1]

POLYGYRA APPRESSA FOSTERI, nov. var.—Shell differing from typical *appressa* in having the sculpture coarser and more rib-like, the parietal tooth somewhat heavier and often larger, and the outer lip with a distinct superior denticle, giving the aperture a form like that of *Polygyra palliata*. The periphery is also obscurely subangulated. Sculpture between the riblets like that of typical *appressa*.

Greater diameter 16.5; Lesser diam. 15.0; Height 9.5 mm. Holotype.

Greater diameter 16.5; Lesser diam. 15.0; Height 10.0 mm. Paratype.

Greater diameter 14.0; Lesser diam. 13.0; Height 8.0 mm. Paratype.

Type locality: Hardin Co., Ill., 3 miles N.W. of Elizabethtown, in valley of Big Creek. Holotype, No. Z32079; paratypes, No. Z23280 Museum of Natural History; paratypes, No. 157437 Academy of Natural Sciences of Philadelphia.

This race of *appressa* appears to be very constant in a species noteworthy for its variation. The typical form might easily be taken at first sight for a small form of *Polygyra palliata* with the hairy surface polished. In the type locality 80 specimens were obtained, and only five were without a strong upper denticle on the lip. The rib sculpture of the surface is like that of *Polygyra appressa linguifera* (Fér.), (*sculptior* Chadwick), but there are no spiral lines as in that race, which also lacks the tridentate form of aperture. The sculpture of *fosteri* between the rib-striae is like that of *P. appressa appressa*.

P. a. fosteri is the common form of *appressa* in Illinois where it is found on the limestone bluffs bordering the Ohio and Mississippi rivers, and in the hilly region of southern Illinois. *P. appressa appressa* is very rare in Illinois, only about a dozen specimens having been found during a season's collection by two men of experience. Upward of 1,000 speci-

[1] Contribution from the Museum of Natural History, University of Illinois, No. 67, and the Illinois State Natural History Survey, in coöperation.

mens of the *fosteri* race have been collected and the variation toward typical *appressa* is only about five per cent. In the type locality the specimens were found under heavy blocks of limestone in gullies and hillsides.

What the distribution of the new race may be is not at present apparent from the material in the collection of the museum. The typical form is represented by some 25 lots ranging from Iowa to Alabama and Georgia. In Illinois the race *fosteri* has been collected along the Ohio from Shawneetown to Cairo and on the Mississippi from Burlington, Iowa to Cairo. It was also found in Calhoun Co. in both the Illinois and the Mississippi valleys. How far north it may extend in the state is not known. Its distribution outside Illinois is unknown. It occurs in Iowa in the Mississippi valley and probably southward in Missouri. It should be found on the Indiana side of the Wabash River and on the Kentucky side of the Ohio River.

The specific name is given in recognition of the efficient work of Mr. Thural Dale Foster, a graduate student in zoology in the University of Illinois, my assistant in the molluscan survey of Illinois now being conducted by the Illinois State Natural History Survey. This organization has deposited its entire collection of land Mollusca in the museum of the University of Illinois to form the basis for a manual of the land mollusks of Illinois.

NEW WEST AMERICAN SPECIES OF BULIMULUS AND NASSA

BY H. A. PILSBRY AND H. N. LOWE

BULIMULUS SANMARCOSENSIS, n. sp. Pl. 5, fig. 1.

San Marcos Island, Gulf of California. Type 158976 ANSP., collected by H. N. Lowe, January, 1932. Paratypes in Lowe collection.

A species related to *B. lamellifer;* oblong-conic, glossy, of 6½ convex whorls, the initial half whorl smooth, next whorl delicately costulate, subsequent whorls with weak growth

wrinkles but no spiral striation. Aperture shaped about as in *B. ximenez* Hanna but white within. Axis with a more or less emarginate vertical fold within the last whorl a half turn back, and much smaller than the internal fold of *B. ximenez* or *B. lamellifer*.

Length 31.3 mm.; diam. 14.7 mm.

Length 30.3 mm.; diam. 16.0 mm.

This is the first land shell to be found on San Marcos, which is a long distance from any island inhabited by snails of this group.

BULIMULUS CARMEN, n. sp. Pl. 5, fig. 2.

Salinas Bay, Carmen Island, Gulf of California. Type 158995 ANSP., collected by H. N. Lowe, Jan., 1932. Paratypes in Lowe collection.

The shell is less solid than usual in *B. ximenez*, and of rather stout figure, the color avellaneous. Fresh specimens and some bleached ones show fine, granulose spirals on the last whorl, but sometimes these are not visible in bleached shells. The internal axial fold is much weaker than in *B. ximenez*, and of the corkscrew form, not a large vertical plate as in that species. It is perhaps still nearer to *B. slevini* Hanna, of Montserrate Island, but the internal flange of the axis, when developed, is situated higher up. In some specimens which seem otherwise to be adult the axis has practically no callus, and viewed in the back it is nearly straight and somewhat oblique.

Length 35.5 mm.; diam. 17.00 mm.; 6½ whorls.

It is quite possible that this form would better be treated as a race of *B. slevini*. The latter often has a quite perceptible spiral callus on the axis, though other specimens in the same lot may show none. *B. slevini* is undoubtedly a *Leptobyrsus* (*Sonorina*)[1], having the appearance and surface of that group, and quite unlike the group of *B. montezuma*.

---

[1] *Sonorina* was proposed to replace *Leptobyrsus* Crosse and Fischer, which was supposed to be preoccupied by *Leptobyrsa*, in Insecta; but late decisions of the International Commission would allow both of these names to stand.

At the south end of Carmen Island small specimens of *B. ximenez* were found, with the axial fold typical of that species.

NASSA BAILYI, n. sp. Pl. 5, figs. 4, 5.

Champerico, Guatemala. Type and paratypes 141642, 141642*a*, ANSP., collected by J. L. Baily, Jr., 1926; other paratypes in collections of Baily and Lowe. Also Mazatlan, collected by Lowe.

The ovate-conic shell has a straightly conic spire and acute apex; about 8 strongly convex whorls, the last ascending in front. Color violet-black, fading to violet-slate on the base and below the suture, with an interrupted white band at the shoulder and ascending the spire. Peristome ochraceous-orange. Axial sculpture of folds equal to their intervals, and obsolete in the concavity below the suture. Spiral sculpture of two or three threads in the subsutural concavity (often obsolete) and stronger cords on the convexity of the whorls, three or four on the penult, six to eight on the last whorl. Siphonal fasciole prominent. Aperture dark and smooth within. Outer lip narrower and strongly arcuate anteriorly, preceded by a varix, and with about 6 (5 to 10) short folds at the inner margin. Columella vertical, dilated, with a sharp basal fold and some irregular short folds on its face. Parietal callus transparent, showing the dark under color, its edge appressed; a short fold near the posterior angle.

Length 14 mm.; diam. 9.2 mm.

Length 9.7 mm.; diam. 6.0 mm. Smallest.

Length 15.0 mm.; diam. 9.8 mm. Type.

This species belongs to the group of *N. luteostoma*, a larger shell with different sculpture. From its wide distribution and conspicuously colored aperture we were unwilling to believe it new, but a careful search of the literature has not turned up anything closely similar.

NASSA LEUCOPS, n. sp. Pl. 5, fig. 3.

Estuary back of Kino Bay, Sonora, Mexico. Type 158260

ANSP., collected by H. N. Lowe. Paratypes in Lowe collection.

The shell is acutely ovate-conic, very pale gray with brownish tubercles and on the back of last whorl some blackish-brown streaks. Axial sculpture of many low, close folds which are raised into rounded tubercles where equally low spiral cords cross them; both folds and cords being very weak except at their intersections. On the penult whorl there are about 20 ribs and on its back 3 spirals; on its front and on earlier whorls 2 spirals, and on the last whorl 8 spirals. The last three axial ribs are short, hardly extending below the periphery, leaving a relatively plain area back of the lip. A well developed varix strengthens the lip. Aperture smooth within, the outer lip with about 5 short ridges at its inner edge, a median one decidedly larger than the others. Columellar lip white, often with a brown spot near the root of the columella, reflected, with free edge, a sharp basal fold and several short, indistinct plaits on its face. Parietal callus transparent, appressed. There is a rather long fold near the posterior angle.

Length 14.5 mm.; diam. 8.6 mm.; 9 whorls. Type.

Length 11.3 mm.; diam. 7.0 mm.

This species is closely related to *N. moesta* Hinds (*N. brunneostoma* Stearns), but it is decidedly wider in figure, has a row of tubercles fewer on the penult whorl, and the lip and columellar callus are white, not dark brown as in *N. moesta*.

A PARASITIC BRACHIOPOD

BY CARROLL LANE FENTON

Modern brachiopods of the order Telotremata normally spend their adult lives firmly attached to rocks, shells or other solid objects in their environments. Parasitic growth can occur only under unusual circumstances, and then as an abnormality. Embryonic brachiopods have no means of penetrating the bodies of other organisms, and it must be uncommon for them to find their way into such bodies and

there encounter conditions which permit continued growth.

One case in which this had been accomplished was brought to my attention in July, 1930, by a student at the Puget Sound Biological Station, Friday Harbor, Washington. He had selected for dissection a large specimen of the snail, *Argobuccinum oregonense* (Redfield), to whose surface was attached a small specimen of *Terebratalia transversa caurina* (Gould). Upon breaking the conch, he found a second brachiopod within the body whorl, its pedicel firmly attached to the shell, and its anterior margin partly buried in a gash worn into the liver of the snail. From the liver itself he

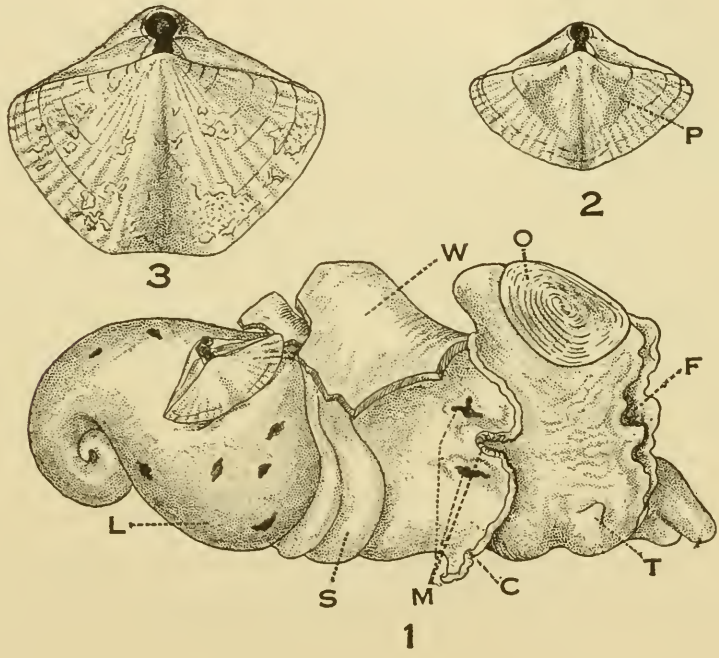


Fig. 1. *Argobuccinum oregonense* (Redfield), with shell removed, showing *Terebratalia transversa caurina* (Gould) in position of growth, × ⅔. C, mantle collar; F, foot; L, liver, showing holes made by annelids; M, healed, but open wounds in the mantle; O, operculum; S, stomach; T, tentacle; W, shell.

Fig. 2. *T. transversa caurina* (Gould); brachial view of the shell shown in Fig. 1, × 1. P, color markings in shell.

Fig. 3. *T. transversa caurina* (Gould), brachial view, × 1. A somewhat distorted shell dredged from a depth of 145 meters, near Shaw Island, Puget Sound.

secured three small but active nereid annelids, perhaps *N. vexillosa* Grube.

The shell of the *Terebratalia*, shown in Fig. 2, is of unusual shape, being short in proportion to its width, with relatively over-developed umbonal region on the pedicel valve. The valves are thin, especially anteriorly, and bear several distinct growth wrinkles; in the region of the lophophores they bear color markings which originally were a dull red, somewhat heightened by translucence. Those of the brachial valve are indicated in P of Fig. 2. The lophophores were of the same dark color, probably caused by the adhesion of material derived by wear of the snail's liver.

The mantle of the *Argobuccinum* readily explained the presence of both the annelids and the brachiopod, since it bore three openings through which they might have entered. Two of these were wounds which penetrated the mantle itself; one was a rent which had torn it from the wall of shell; all were completely healed on their edges, yet offered openings of considerable size. Through them had come the annelids and the larval brachiopod. The former found confining shelter and nourishment; the latter encountered an environment which, though not hospitable, permitted life, and thus became an unintentional domiciliaire of an unwilling but helpless host.

POLYGYRA PLATYSAYOIDES NOV. SPEC.[1]

STANLEY T. BROOKS, PH.D.

This extremely flattened form of *Polygyra* was collected by Mr. Graham Netting, Curator of the Section of Herpetology in the Carnegie Museum, at Cooper's Rock, Monongalia Co., West Virginia. It is such a striking shell in both shape and size that it seems impossible that it could have remained unknown for so long. However, after seeking in vain for any description of it, I wish to propose the name

[1] A contribution from the Laboratory of Recent Invertebrates of the Carnegie Museum.

POLYGYRA PLATYSAYOIDES, new species.

The five whorls are flattened and only very slightly convex; base flattened and slightly inflated at the aperture. The shell is thin and translucent but is not fragile. The color is light horn with a yellowish area on the exterior surface of the peristome which exhibits a punctate appearance. This area of punctation extends back past the constriction of the peristome and over the first four or five oblique striae. The whorls striated obliquely, terminating in the wide, inverted-cone-shaped umbilicus which exhibits all of the volutions to the apex. The first whorl smooth. The umbilicus seems

Polygyra platysayoides.

slightly excentric due to the deflection of the body whorl at the aperture. The aperture is oblong-lunate. The lip is reflected, flat, white, and quite heavy; the basal edge forming quite a straight line, thickened with a deposit of callus. The basal angle thickened and extending into the body whorl, visible in the umbilicus as a whitish band for the full length of the body whorl. On the parietal wall is a thick, obtusely pointed, tongue-shaped tooth, its apex directed tangentially out and away from the aperture; it is quite similar to the parietal tooth in *P. dentifera*.

Greater diameter 22 mm.; lesser 18 mm.; height 8 mm.

The specimen at hand had several minute perforations in the body whorl that have been repaired leaving small white tubercles visible from the aperture and on the exterior. Type in Carnegie Museum Coll., No. 62.23750.

THE REDISCOVERY OF OREOHELIX HAYDENI (GABB)

BY ELMER G. BERRY
Department of Zoology, University of Utah

In 1869 William M. Gabb described the interesting species *Oreohelix haydeni* from Webber Canyon, Utah. This is now called Weber Canyon, a canyon approximately forty miles in length, between South Ogden, Utah, and continuing east to beyond Echo, Utah. There are many tributary canyons in Weber Canyon, and the type locality of *Oreohelix haydeni* has not hitherto been rediscovered.

Miss Betty Knight, a student of botany in the University of Utah, presented the author with a few shells of *O. haydeni* which she had collected near Devil Slide, Weber Canyon, during the early fall of 1929. In the spring of 1930 the writer organized a small party to search for the living specimens. They were discovered after a little difficulty living in Dry Creek Canyon, the first tributary canyon south of the cement plant, at Devil Slide, Utah, under the dead leaves of *Amelanchier alnifolia* Nutt., near the base of the shrub. The entire region surrounding the cement plant is covered by a thick coat of cement dust making the environment anything but favorable for mollusca. The species is very localized in this one tributary canyon. Adjacent tributaries and the mountain sides across from the Weber River yielded several varieties of *haydeni*, e.g., *hybrida* (Hemphill) and *gabbiana* (Hemph.), but the typical forms were found only in this one small tributary as noted above. Figured on Plate 3.

From the specimens collected it is recognized that the species is exceedingly variable, ranging from high spired forms to very flat, depressed forms. Each specimen, however, possesses the sharp prominent spiral ribs both above and below the periphery with a distinct channel below each rib. Occasionally riblets are present in the channels. The color of the shells of the living specimens is a dull ashy-gray. The dead shells are chalky white. Comparative measurements from a dozen mature specimens follow; also the number of spiral ribs on the last whorl. Additional threads when present are added in parenthesis.

Diam.	Height	Whorls	Ribs above, incl. periphery	Below	Total
17.7 mm.	11.6 mm.	5	4(+2)	5	9
19.0	12.0	5¼	3(+2)	5	8
19.5	11.2	5	4	5	9
19.8	12.9	5	4	9	13
20.1	13.4	5	5(+1)	7	12
20.2	13.2	5	4	6(+2)	10
20.3	11.4	5	5	5	10
20.8	10.5	5	4	6	10
20.9	13.3	5	4	6(+1)	10
21.0	13.4	5	3(+1)	5(+1)	8
21.1	12.6	5½	3(+1)	5(+1)	8
22.3	16.5	6	5	5	10

It is noted that there are 2¼ nuclear whorls. The first whorl is finely striated but spiral riblets do not appear until the second whorl. There are two riblets above the periphery, one forming the carina and from four to five below the periphery. The average size is: diameter, 3.6 mm.; altitude, 2 mm.

Two varieties which are the closest allied to the type species are *Oreohelix haydeni oquirrhensis* (Hemphill) and *Oreohelix haydeni corrugata* Henderson and Daniels. *Oquirrhensis* is approximately the same size as the true *haydeni*. The peripheral keel, however, is more pronounced on the variety and the ribs are not as strong as on the typical specimens of *haydeni*. At times the spiral sculpture is reduced to riblets on the variety *oquirrhensis*. This has never been observed on the several hundreds of specimens collected of true *haydeni*. *Oreohelix haydeni corrugata* Henderson and Daniels, differs from typical *haydeni* in being a higher spired, a more globose form and averaging more spiral ribs which are not as sharp as those of the *haydeni*. The umbilicus of *corrugata* is narrower and the channels between the sutures are not as deep but are occupied by more spiral riblets than in the true *haydeni*.

The genus *Oreohelix* is one of the most difficult to classify in the Rocky Mountain Region because of the wide variation of its species. At the present time the author is comparing

the morphology of *Oreohelix haydeni* with that of its many varieties. His results will appear in a subsequent number of this periodical.

The author is under obligation to Dr. R. V. Chamberlin, under whose direction his studies on Utah mollusca have been pursued, and to Dr. Walter Cottam for making the photographs.

LAND SHELLS COLLECTED IN SOUTHWESTERN NORTH CAROLINA

BY WM. J. CLENCH AND GILBERT S. BANKS

(Concluded from page 18)

Blowing Springs, Cliff Ridge, Nantahala Gorge, Swain Co., North Carolina:

Polygyra tridentata Say
Polygyra rugeli Shuttl.
Polygyra normalis Pils.
Polygyra appressa perigrapta Pils.
Polygyra nantahala Cl. & Bks.
Polygyra wheatleyi Bld.
Polygyra voluminosa Cl. & Bks.
Polygyra magnifumosa Pils.
Polygyra pilula Pils.
Polygyra cincta Lewis
Omphalina andrewsae Pils.
Omphalina a. montivaga Pils.
Mesomphix laevigata latior Pils.
Vitrinizonites latissimus Lewis
Paravitrea andrewsi W. G. B.
Paravitrea placentula lacteodens Pils.
Paravitrea p. placentula Shuttl.
Retinella pentadelphia Pils.
Retinella sculptilis Bld.
Zonitoides arboreus Say
Ventridens elliotti Redf.
Ventridens acerra Lewis
Gastrodonta interna Say
Euconulus chersinus Say
Anguispira alternata Say
Discus patula Desh.
Haplotrema concavum Say
Strobilops aenea Pils.
Gastrocopta contracta Say

Valley River Mts., 5 mi. S.E. of Andrews, Cherokee Co., North Carolina:

Polygyra tridentata Say
Polygyra rugeli Shuttl.
Polygyra normalis Pils.
Polygyra clarkii Lea
Polygyra wheatleyi Bld.
Polygyra magnifumosa Pils.
Omphalina andrewsae Pils.
Omphalina a. montivaga Pils.
Omphalina subplana Binn.
Mesomphix laevigata Pils.
Zonitoides arboreus Say
Ventridens elliotti Redf.
Ventridens acerra Lewis
Gastrodonta interna Say
Anguispira alternata Say
Discus patula (Desh.)
Haplotrema concavum Say

Two and one-half miles east of Andrews, Cherokee Co., North Carolina:

Polygyra tridentata Say
Polygyra rugeli Shuttl.
Polygyra appressa perigrapta Pils.
Polygyra clarkii Lea
Polygyra barbigera Redf.
Polygyra magnifumosa Pils.
Polygyra cincta Lea
Retinella pentadelphia Pils.
Retinella praecox Baker
Retinella junaluskana Cl. & Bks.
Ventridens elliotti Redf.
Ventridens acerra Lewis
Ventridens gularis Say
Ventridens intertextus Binn.
Ventridens demissus Binn.
Gastrodonta interna Say
Euconulus chersinus Say
Anguispira alternata Say
Discus patula Desh.

NOTES ON WESTERN CANADIAN MOLLUSCA—PLANORBIS CAMPANULATUS WISCONSINENSIS WINSLOW

BY ALAN MOZLEY
The Johns Hopkins University

The molluscan fauna of the western part of the Dominion of Canada is comparatively little known, and while the work of Dall and others had indicated the general nature of the molluscan population, the extent of this region is so vast, and the greater part of it is so inaccessible, that many important points regarding the geographic distribution of the members of this fauna are still obscure. In the course of zoogeo-

graphic studies, it is essential to ascertain not merely the presence of an organism in a certain territory, but at the same time, the extent of the distribution. This is especially true in the sub-arctic region where many animals approach the boundaries of their distribution. At the present time, such information regarding the molluscs of the northern part of North America is almost completely lacking and as a result other workers may be led to believe, from the paucity of records in the literature, that certain species are rarities in the region, while actually this is not at all the case. This may be true of *Planorbis campanulatus wisconsinensis,* and it therefore appears to be worth while to publish a *resumé* of the information so far collected, even though the study as a whole has not yet been brought to a conclusion.

Planorbis campanulatus wisconsinensis is a common and characteristic mollusk in the eastern part of the Province of Manitoba and western Ontario. It is particularly abundant in the lakes on the Canadian Shield, and also to be found here and there in the adjoining forested areas. It has not been collected in any of the lakes on the plains of southern Saskatchewan and Alberta, and is also absent, apparently, from the Rocky Mountain region in the neighborhood of Jasper National Park (latitude 53° N.). It would appear, therefore, that the variety is more or less confined in its distribution to the wooded areas. The record from southern Saskatchewan (near Madge Lake) is from a body of water situated on a southern spur of the northern coniferous forest.

The northernmost locality in the Province of Manitoba from which this variety is recorded is Split Lake, which is situated some distance to the west of Mile 279 on the Hudson Bay Railway (i.e., 279 miles northeast of Le Pas, Manitoba). It is noteworthy that this form was not found to be an inhabitant of the ponds or small lakes on the Barren Ground along the shores of Hudson Bay to the east of Fort Churchill, either in the rock-bound basins or the boggy pools of the tundra, although other species of molluscs were found in both of these situations. Likewise an examination of the pools to the south and west of the ruins of Fort Prince of

Wales, in the neighborhood of the northernmost trees, failed to reveal its presence. In view of this, the northern limit of the range of this variety in this part of the continent appears to be now known within much narrower limits than was previously the case. Whether or not it inhabits the larger bodies of water situated on or near the boundary of the tundra remains to be seen.

Included in this note are only records based upon specimens which have been compared with shells of *wisconsinensis* from the state of Michigan and elsewhere which were obtained through the kindness of Dr. Bryant Walker. Records previously reported are:

ONTARIO. Minaki, Winnipeg River; White Dog, Winnipeg River; Alice and Onion Lakes near Minaki; Redditt, Star Lake; English River, near its junction with the Winnipeg River (Mozley, NAUTILUS, XXXIX, p. 126, 1926).

MANITOBA. Indian Bay station, G. W. W. D. Ry., Falcon Bay (Mozley, loc. cit.); Indian Bay station, Snake Lake (NAUTILUS, XL, p. 60, 1926). Brereton, Brereton and Mud Turtle Lakes (Canadian Field Naturalist, XLI, p. 60, 1927).

The following are new records:

ONTARIO. Lake two and a half miles west of Caramet; Savant Lake district, Elbow Lake; Silver Lake thirty miles east of Port Arthur; marshy pond one mile east of Nickle Lake siding, C. N. Ry.; Rocky Inlet, Rainy Lake.

MANITOBA. Whiteshell River, above the second rapid below Betula Lake; Whiteshell Lake; Crow Duck Lake; small lake on the portage between Whiteshell and Crow Duck Lakes. In stomach of sturgeon from the Winnipeg River above the Seven Sisters Falls. Big Black River near its mouth; Berens River, near its mouth—Herb (Wekusko) Lake, ten miles west of Mile 81 Hudson Bay Railway; lake near Waboden, Mile 137 H. B. R.; Landing Lake near Mile 183, H. B. R.; Split Lake, west of mile 279, H. B. R.

SASKATCHEWAN. Small lake one mile west of Madge Lake, Riding Mountain, north of Kamsack, Sask.

Habitat preferences.—*Planorbis campanulatus wisconsinensis* is often to be found in both exposed and protected situations in fairly small lakes. It also occurs sometimes in rivers, particularly along their marshy borders. At Indian Bay, Manitoba, it has been found abundantly in quiet water

on driftwood and among aquatic plants such as *Zizania* and *Utricularia*. At Minaki it inhabits the rocky shores of a quiet backwater of the Winnipeg River, while in Lake Brereton and Mud Turtle Lake it is to be found on shores of smooth rock which are more or less subject to wave action. Beds of wild rice (*Zizania*) such as are found in Snake and the wild rice (Zizania) such as are found in Snake and the Whiteshell Lakes usually afford excellent habitats. In general the abundance of this snail in the region of the northern coniferous forest stands in striking contrast to its complete absence (within the area covered) from the forest-grassland transition and plains regions. As has been noted above, it also appears to be absent from the Barren Ground.

NEW PHILIPPINE ISLAND LAND SHELLS

BY MAXWELL SMITH

RHYSOTA LAMARCKIANA Lea GLOBOSA, new subspecies. Pl. 4, fig. 10.

Spire more produced than in the type, nuclear whorls similar but others more rounded, suture well impressed, peripheral keel less acute with a light zone above, band below much narrower, spiral growth lines becoming inconspicuous upon the last whorl, brownish green color below. Alt. 29.5 mm., diameter 48.5 mm.

Habitat: Passi, Iloilo, Panay. "On leaves of bamboo shaded by buri palms along salty river called Taclong in Visayan dialect."

This distinct geographical race is easily separated by the high spire and unusual sculpture. Type in the writer's collection.

CAMAENA AMATANGANA, new species. Pl. 4, fig. 9.

Shell thin, pupiform, umbilicated, suture moderately impressed, yellow brown except for light yellow zone below the periphery forming a band which is also apparent upon the lower portion of the previous whorl adjoining the suture,

also within and adjacent to the umbilicus; whorls 6, the last elongated; surface sculptured with distinct irregularly spaced oblique riblets, broken principally below by moderately impressed malleations; aperture slightly oblique, lip reflexed, tinged with brown. Alt. 27 mm., diameter 23 mm.; aperture alt. 15.5 mm.

Habitat: Amatang, N. W. Coast of Mindoro. A small series of dead specimens from Camorong, Abra de Ilog show a light yellow brown surface with brown band at the periphery.

Type in the Paul McGinty collection.

This form connects *C. arata* Sowb. with *C. oomorpha* Sowb. From the former the small size, large aperture, fine riblets and presence of malleations distinguish it. The 6 whorls, riblets and less impressed suture separate it from the latter.

CAMAENA OOMORPHA DEMESANA, new subspecies. Pl. 4, fig. 7.

A light yellow form without bands. Alt. 26.5 mm., greater diameter 17.5 mm., aperture alt. 13.5 mm.

Habitat: Tara, Abra de Ilog, Mindoro.

I take pleasure in associating with this form the name of its discoverer Pedro de Mesa. Type in the Paul McGinty collection.

HELICOSTYLA MCGINTYI, new species. Pl. 4, figs. 1, 2.

Shell umbilicate, crevice beneath the broad columellar lip moderately impressed, elongated-ovate; surface straw yellow below, dark red brown above the periphery with darkest zone near suture, surface streaked above with yellow irregular stripes, shining; whorls 7, body whorl with two or more distinct slightly impressed transverse lines, the intersecting growth lines having the tendency to extend backward, these lines also present on other whorls; aperture almost one-half length of shell, interior bluish white, callus lacking upon parietal wall but extremities of peristome joined by an extremely narrow indistinct brown line; peristome strongly

reflexed close to its junction with wall above umbilicus. Alt. 57.5 mm., aperture alt. 28.5 mm.

This form fits perfectly between *H. chrysalidiformis* Sowb. and *H. mindoroensis* Brod. In common with the former it possesses the hydrophanous light patches, blunt apex and similar suture but exhibits in the aperture a totally different ratio with respect to length of shell and also in its peculiar sculpture. From *H. mindoroensis* the shining surface and more cylindrical form readily distinguish it.

Habitat: Amatang, N. W. Mindoro.

The type is in the Paul McGinty collection, Detroit, Mich.

HELICOSTYLA CHRYSALIDIFORMIS Sowb. CALAWAGANENSIS, new subspecies. Pl. 4, figs. 4, 6.

Surface flesh color, darker upon the earlier whorls, lip broadly expanded and strongly subreflexed, bordered outside with reddish brown shading to rose within, hydrophanous streaks straw yellow, apex white, slightly angular at the periphery. Alt. 49.5 mm., aperture alt. 44.5 mm., some examples considerably larger.

Habitat: Calawagan, N. W. Mindoro.

Type in the writer's collection.

This race approximates *v. antoni* Semper, which also occurs in the same region, but justifies recognition on account of the totally different color of both surface and aperture.

HELICOSTYLA PITHOGASTER Fer. BATOANA, new subspecies. Pl. 4, fig. 3.

Three apical whorls pale yellow, shining, the following yellow brown, also shining, the last two and one-half dark reddish brown, covered almost entirely with an evenly distributed olive slate colored hydrophanous cuticle. A distinct narrow dark band appears shortly below the suture upon the last two whorls formed by the absence of the cuticle. Upon the earlier whorls this sutural uncovered zone naturally agrees with the different ground color. Whorls 6¼; aperture bluish white within with rose brown columella, callus

partially covering the parietal wall. Alt. 62 mm., greater diameter 42 mm., aperture alt. 32 mm.

Habitat: Bato Municipality, Catanduanes.

Type in the writer's collection.

HELICOSTYLA TURBINOIDES Brod. SULANA, new subspecies. Pl. 4, fig. 5.

Five distinct colors usually occur upon this form, the apical whorls flesh color, the succeeding one red, the following light olive green with occasional indistinct streaks of a lighter shade. A long series of this race shows considerable variation with some abnormal contracted forms. In the type, illustrated, most of the silvery hydrophanous bands are present upon the body whorl, a broad one below the suture, with nine more or less distinct bands below. Alt. 74.5 mm., greater diameter 60 mm., aperture alt. 49 mm.

Habitat: Sula Mountains, Bato Municipality, Catanduanes.

Type in the writer's collection.

A NEW MINDORO LAND SHELL

BY THOMAS L. MCGINTY

HELICOSTYLA VIRGATA MAXWELLSMITHI, new subspecies. Pl. 4, fig. 8.

Spire slender; early whorls white, ground color cream with light brown band below the suture, similar dark color extending parallel to and outside the peristome and above the umbilical area; lip very broadly expanded, narrowly edged both inside and out with dark chocolate brown, extremities of peristome joined with band of same color; surface variegated with oblique stripes of *silvery white hydrophanous cuticle* with the same color upon the exterior of the lip.

This exceedingly beautiful form was collected at Buleran, Naujan, Mindoro. Type in the collection of Maxwell Smith, Lantana, Florida; holotypes in the Paul P. McGinty collection, Detroit, Mich.

BOSTON MALACOLOGICAL CLUB

The Boston Malacological Club has held its meetings as usual, during the past season, in the Library of the Boston Society of Natural History, on the first Tuesday evening of each month, from October to May, inclusive.

At the first meeting the Club was addressed by Dr. Carlos G. Aguayo, of Havana, who spoke on the distribution of land-shells in Cuba, emphasizing the richness of the island as a collecting ground, where twelve hundred species can be found.

Dr. Joseph C. Bequaert, of the Department of Tropical Medicine, Harvard Medical School, was the speaker at the November meeting, his subject being African land-mollusks. He spoke especially of the sub-family Achatininae, which is found only in Africa, and which numbers fourteen genera.

The December meeting was addressed by Dr. David L. Belding, who gave a paper on "Cycles in Animal Life, and the Salmon Fishery".

In January the Club listened to a paper by its President, Prof. Francis N. Balch, entitled "Shells and Human Prehistory". After a rapid survey of the geological periods before human life appeared on the earth, he told of the remains of primitive man and his cultures, which have been found, especially of those in the south of France, and of the shells discovered in the burial places.

Mr. William J. Clench, of the Museum of Comparative Zoölogy at Harvard, spoke at the February meeting on the land-mollusks of the Solomon Islands. After giving an account of this little-known group of islands their position and extent, he showed that though the islands are rich in material little work has been done there, and collections of native shells are scarce. Harvard possesses as representative a collection as any. A series shown by Mr. Clench excited much interest.

The March meeting was a departure from the usual course; two members, Miss Seymour and Miss Sawyer acting as hostesses at what might be termed a "quiz-party" on

the subjects covered at the season's meetings that far. The meeting closed after the showing of a movie-film of cuttle-fish and octopus in their native haunts.

For the April meeting the members were the guests of the Boston Aquarium Society at Teachers' College, where Mr. Orrin C. Bourn, of the Massachusetts Fish and Game Commission, spoke on the fish-ladders, which, since the advent of many mills, have been constructed in sluice-ways in order to aid such fish as salmon, alewives, shad, and white perch, to pass from the ocean to the spawning ponds.

The speaker in May was Mr. Clench who told of the sources from which the land-shells of the Philippines were derived. While there are no present continental types to be found on the true Pacific Islands, comprising the remote groups, the land mollusks of the Philippines trace their ancestry to four sources, two being from Borneo, one from Papua, by way of Gilolo, and one from Formosa. A collection of shells, chiefly of the genera *Helicostyla, Amphidromus, Camaena* and *Leptopoma* added to the interest of the paper. Plans for the Club's field meeting in June were discussed. The following officers were elected for the coming year:

President, Mr. Charles W. Johnson.

Vice-President, Miss Mildred Seymour.

Secretary-Treasurer, Miss Theodora Willard.

Conchological Recorder, Mr. S. N. F. Sanford.

Executive Committee, Miss Madalene B. Sawyer, Mr. William J. Clench.

THEODORA WILLARD, *Secretary.*

PUBLICATIONS RECEIVED

A NEWLY DISCOVERED WEST INDIAN MOLLUSK FAUNULA. By Paul Bartsch. (Proc. U. S. Nat. Mus., vol. 81, Art. 6, 1932.) Beata Island, off the southern point of Haiti, proves to have a rich land shell fauna special to the island, though only about 6 miles from the main island. Fourteen new species in almost as many genera are described.

The Gastropods of the St. Louis, Missouri, Pennsylvanian Outlier: IV, the Pseudomelaniidae. By J. Brooks Knight. (Journ. of Paleontology, June, 1932.) The relationships and the species of the little-known genera *Acteonina* and *Meekospira* are studied. The status of Pseudomelaniidae as a perfectly valid family is maintained.

On an Increase in the Naiad Fauna of Saginaw Bay, Michigan. The Naiad Species of the Great Lakes. By Calvin Goodrich and Henry Vander Schalie. (Occ. Papers Mus. Zool. University of Michigan, No. 238.) Thirteen species were taken in Saginaw Bay in 1931; four of these, *Fusconaia flava parvula, Proptera alata, Lasmigona complanata katharinae* and *Dysnomya triquetra* were not found by H. B. Baker, who made a study of the mollusks of this region in 1908, and they are apparently more recent immigrants. In the second paper the species of the Great Lakes are enumerated.

A New Fossil Ancylus from Jehol. By Chi Ping. (Bull. Geol. Soc. China, vol. 11, No. 2, p. 201.) A Cretaceous fossil is described as *Ancylus teilhardi*. The moulds show a spiral suture of several whorls, like a calyptraeid snail, or the top of some low spiral gastropod, and not like any of the Ancylidae.—H. A. P.

NOTES AND NEWS

Diplomorpha coxi (Pease).—This species was first described as *Bulimus* (?*Borus*) *coxi* Pease from the Solomon Islands. It was never figured. Pilsbry 1900 (Man. of Conch. [2], 13, p. 90), placed it with a question in the genus *Placostylus*. The short description given by Pease, the lack of a figure, and the wrong locality prevented the proper placing of the species. Later this same form was described as *Diplomorpha coxi* by Hartmann. A third name was added by Pilsbry, *Placostylus* (*Diplomorpha*) *coxiana,* to replace *D. coxi* Hartmann *non B. coxi* Pease. The following is the synonymy:

DIPLOMORPHA COXI (Pease). Pl. 2, fig. 8.

Bulimus (*?Borus*) *coxi* Pease 1871, Amer. Jour. Conch., 7, p. 197.

Diplomorpha coxi Hartmann 1891, Proc. Linn. Soc. New South Wales, (2), 6, p. 571, pl. 21, figs. 1, 3, 6.

Placostylus (*Diplomorpha*) *coxiana* Pilsbry 1900, Man. of Conch. (2), 13, p. 118, pl. 72, figs. 13, 14.

It does not occur in the Solomon Islands but in the New Hebrides. The holotype is: Mus. Comp. Zool., 86495. Pease collection.—W. J. CLENCH.

POLYGYRELLA POLYGYRELLA in the John Day Miocene (or Oligocene). In my notes on the distribution of this genus, Proc. A. N. S. Phila., 1932, p. 18, I overlooked the record of this species by Dr. G. D. Hanna in the John Day beds of Oregon, whence *Ammonitella lunata* (Conr.) was described (in Univ. of Oregon Pub., vol. 1, No. 6, p. 3, 1920).—PILSBRY.

DR. H. A. PILSBRY has been elected an Honorary Member of the California Academy of Sciences.

BITHYNIA TENTACULATA (L.) IN THE POTOMAC.—This species was first found by Dr. W. P. Woodring, who collected a pair of dead specimens at Hunter's Point, near Alexandria, Va., in May, 1927 (No. 143310 ANSP.). No announcement was made at that time as I suspected that they might be ballast shells; but the find by Mrs. Robertson this year makes this improbable. So far, only dead shells have been taken.—H. A. P.

GASTROCOPTA MUNITA ON SOUTH SEYMOUR ISLAND, GALAPAGOS GROUP.—In the paper on the land shells of the Galapagos Islands by Dall and Ochsner, no species was listed from South Seymour Island. During a trip to those Islands in January, 1932, on Captain G. Allan Hancock's yacht, *Velero III*, the writer collected several specimens of *Gastrocopta munita* Reibisch. (Dall, W. H., and Ochsner, W. H., Landshells of the Galapagos Islands. Proc. Calif. Acad. Sci. Ser. 4, vol. 17, No. 5, pp. 141-185, pls. 8 and 9, June 22, 1928; Pilsbry, H. A., Man. Conch. Ser. 2, vol. 24, 1916-1918, pp. 96, 357, pl 19, figs. 1-7, 8, 10, 11) These were found

under bushes, on top of the plateau on the southeast part of South Seymour Island. The species was listed by Dall and Ochsner from Charles, Duncan, Albemarle, Narborough and Tower Islands. Dr. G. Dallas Hanna kindly identified the species for the author.—Leo George Hertlein.

Location of the Collection of Shells Assembled by Rev. J. Rowell.—Evidently the disposition of the Rowell collection is not generally known. (See Pilsbry and Lowe, Proc. Acad. Nat. Sci., Philadelphia, vol. 84, 1932, p. 97.) After the death of the owner it was donated to the University of California, Berkeley, California. Apparently it was not received in very good condition and it has suffered somewhat through years of use by undergraduate students. It has not been kept intact at the University, but has been merged with the series of recent shells used by the Department of Paleontology for comparative purposes.—G. D. Hanna and A. G. Smith.

Libera or Garrettina (Endodontidae).—In his "Handbuch der Systematischen Weichtierkunde" 2ter Teil, p. 572, Dr. Thiele proposed a new generic name *Garrettina* to replace "*Libera* Garrett, 1881, non (Pease) Paetel, 1873, *Garrettia* Cossmann, 1900, non (Pease) Paetel, 1873". Cossmann's *Garrettia* was proposed to replace *Libera* Garrett on account of "*Libera* Haan", 1825 (Revue Crit. de Paléozool. IV, 1900, p. 43). In Man. Conch. IX, 23, I disposed of this quibble. De Haan was not proposing a genus but a larger group, "Cephalopoda libera" of the nature of a tribe or family. There was no preoccupation of *Libera* Garrett in any shape or form. I have looked through Paetel's Catalog in vain for any mention of *Libera*. It is not there. *Garrettia* Pease is there all right, but this is an operculate snail. So far as I can see, *Garrettia* Cossmann (type *Helix bursatella* Gld.) and *Garrettina* Thiele (type *Helix subcavernula* Tryon) are perfectly useless terms, which would never have been proposed if their authors had looked up the prior nomenclature. *Libera* Garrett, 1881, will stand for the

peculiar group of Endodontidae, with the type *subcavernula* Tryon (=*cavernula* Garrett, not H. & J.).—H. A. PILSBRY.

NASSA MYRISTICATA HINDS.—In a recent paper Mr. Lowe and I discussed this species of the Panamic region, which had been reported from South Africa erroneously. It seems that Mr. E. A. Smith first detected this wrong locality and corrected the error in 1928, Ann. S. Afr. Mus. XXV: 322. —H. A. P.

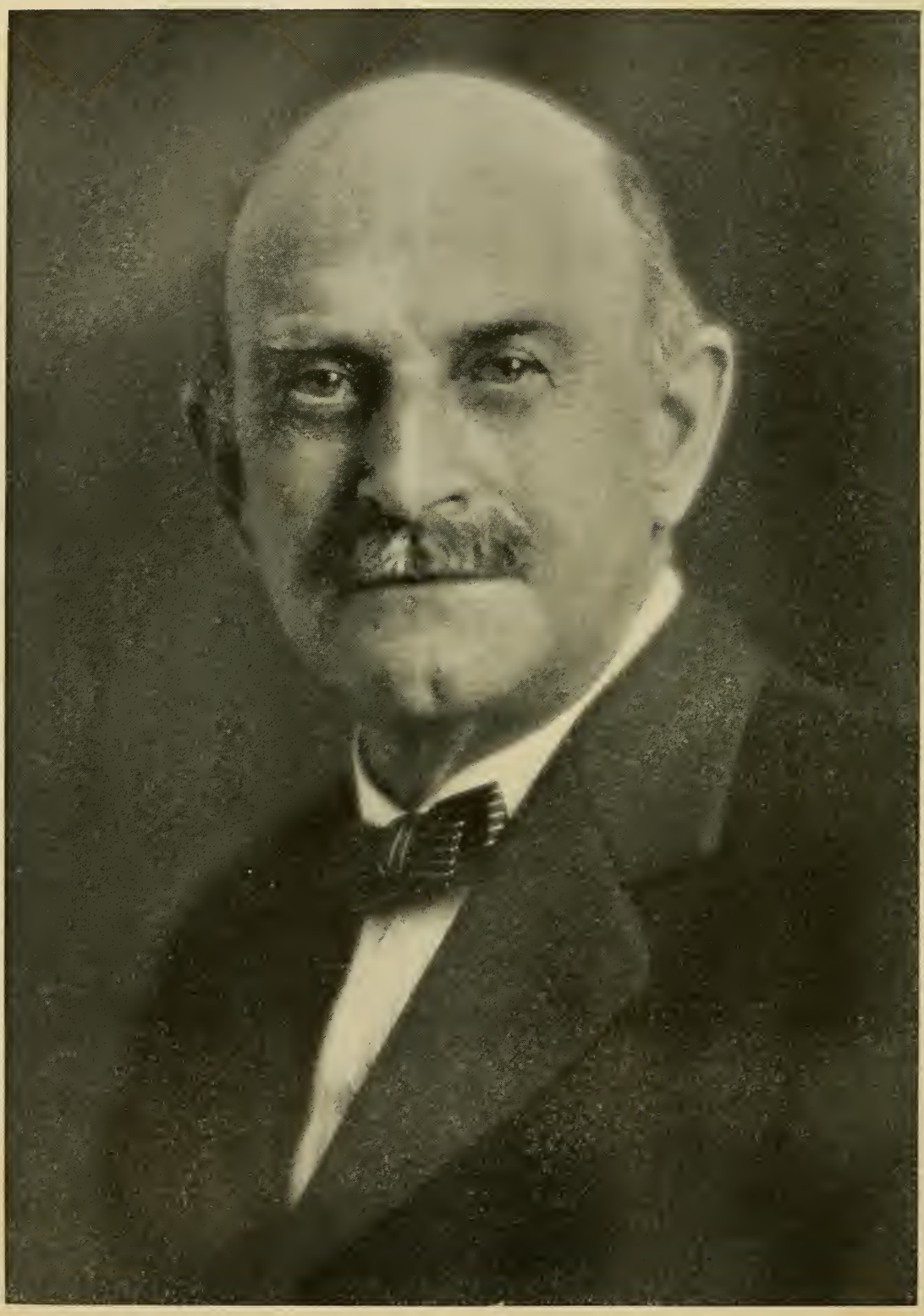
NOTE ON HELICOSTYLA AND COCHLOSTYLA.—In my system of Philippine tree snails (Man. Conch. IX, 1895) I used the name *Helicostyla* Fér. for the well known genus in place of *Cochlostyla* Fér. Both names were proposed in the same work (Tableau Systématique de la Famille des Limaçons, 1821) and are thus of the same date, *Helicostyla* having page precedence. In such a case, according to the International Rules, Art. 28, "that [name] selected by the first reviser shall stand", and "other things being equal, that name is to be preferred which stands first in the publication (page precedence)". Beck seems to have been the first reviser to deal with these names; he used *Helicostyla* but did not admit *Cochlostyla,* which he treated as a synonym of *Bulimus.* Gray (P. Z. S. 1847, p. 171) was the first to name a type for *Helicostyla, H. galactites* (=*mirabilis*) (cf. Beck, p. 37). This was accepted by von Martens, 1860, and by later authors. Gray did not name a type for *Cochlostyla,* placing it (p. 174) in the synonymy of *Orthostylus* with a choice of two species as type, *Helix viridis* and *Bul. metaformis* Fér. I have not been able to find that a type has ever been selected for *Cochlostyla.* On the whole, the weight of evidence appears to be in favor of using *Helicostyla,* with the type *H. mirabilis* Fér. (=*galactites* Lam.) as generic name for these Philippine snails; *Cochlostyla* Fér., with the type *H. metaformis* Fér. here designated becoming a synonym.

In this connection it may be mentioned that a new spelling, *Hypselostylus* (Bartsch, Journ. Wash. Acad. Sci. 22:

337, June, 1932) has been introduced for the subgenus *Hypselostyla* (von Martens) Pfr.

Columplica Hartmann, 1842, was used as a subgeneric name for *Helix cepoides* Lea in Man. Conch. IX, 226, but I overlooked the fact that Herrmannsen had named *Helix unidentata* Chemn. as type (Ind. Gen. Malac. I, 274), thus making *Columplica* a synonym of *Stylodonta* C. & J. As *Hypoptychus* Pils. 1892, is a homonym of *Hypoptychus* Steindachner, 1880 (Pisces), the group remains without a valid name. It may be called STEATODRYAS, type *Helix cepoides* Lea.—H. A. PILSBRY.

"CHINA STRAITS".—That yarn of "Syd Swagman's" (B. 3/2/'32) about the shark he tamed for mustering beche-de-mer recalls an experience of my own with an octopus. I was putting in piles for the wharf at Samarai at the time, and one morning, after a red-hot night and a pull-together next morning at Billy the Cook's, I put on the dress again and went down to the job. First thing I knew an octopus with arms about 15 ft. long had nailed me. I knew it was no use to struggle, so tickled the creature gently under the chin, gazing amiably at it through the glasses of my helmet. The stunt succeeded, and—would you believe it?—every morning I went down the thing was there waiting, wagging all its feelers as soon as it caught sight of me. Everyone knows that the strait between Samarai and the mainland holds some of the finest shell in the world, but because of the depth and the terrible currents no diver dares to fish it. After a bit, that octopus would be at the rendezvous every morning with about two dozen of the finest shell you ever saw; and a good thing I made of it. When the job was done I didn't see my friend again until one day someone came to say a dead octopus had been washed ashore opposite Mother Platt's. I recognized the remains at once and had them accorded decent burial. The more so because a German naturalist, who had held the postmortem, told me it was a lady octopus and had evidently died of a broken heart.—THE BULLETIN, February, 1932 (Australia).



CHARLES WILLISON JOHNSON

THE NAUTILUS.

Vol. XLVI JANUARY, 1933. No. 3

THE CRUISE OF THE "PETREL"

BY HERBERT N. LOWE

It has been said that the unexpected things in life are often the most enjoyable. Such was the case November, 1931, when I had the opportunity of joining a scientific expedition to the islands of the Gulf of California.

Our party numbered six including the Captain who presided over engine room and galley. There were the owner of the yacht who collected reptiles, the ornithologist, the mammalogist, the carcinologist and the conchologist.

The "Petrel," sturdy sixty-five foot yacht equipped with a seventy-five horsepower Diesel engine and Delco for lights and power for refrigeration, was roomy and well fitted for an expedition of this nature.

We carried four dredges of various sizes, two tangles, and many fathoms of rope. All of this equipment with the exception of one tangle was lost before the end of the trip. In spite of all this we did some quite good dredging in water from five to twenty fathoms in depth.

We left our home port on the day before Thanksgiving, keeping close to the shore-line on our southerly course. As the night came on we passed in review the lights of all the small towns from Laguna south. At midnight we were off Point Loma, and early next morning we were at anchor off the Mexican port of Ensenada where we took out our clearance papers.

Our Thanksgiving dinner was eaten in foreign waters in the shelter of the Todos Santos islands. As we proceeded south the weather gradually became warmer. We passed

tiny San Geronimo Island, lava-covered San Martin Island with its extinct crater, lofty Cedros Island with its cedar crowned heights hidden in the clouds, flat Natividad Island, and on Sunday morning dropped anchor in Santa Maria Bay. We made a few hauls with the dredge with good results, and all went ashore at noon to ply their various vocations. The low tide yielded quite a good assortment of molluscan life.

At three o'clock the next afternoon we entered the port of Magdalena Bay and anchored for the night off the old whaling station at Belcher's Point. Owing to a recent rain the *Micrarionta areolata* Sby. were crawling over the desert vegetation, as they were also doing on our second stop on the east side of the bay. These were much smaller and higher than the colony at Belcher's Point.

At our stop on the southeast side of Margarita Island our first *Bulimulus hannai* Pils. were encountered in the rock slides high up on the north slopes. At this anchorage we took some gorgeous lemon-colored sea fans in about ten feet of water. On these we found some half grown *Pteria sterna* Gld. and a small yellow crustacean exactly the same color as the sea fans.

Because of the indifferent tides encountered during our week at Magdalena Bay, the marine collecting was very poor. This seems to be the headquarters for *Conus fergusoni* Sby. Dead battered specimens were on the beaches by the hundred but not a single perfect one. We did not take this shell at any place in the Gulf. As we rounded Cape San Lucas, the extreme point of the peninsula, we decided to spend the entire day in this fisherman's paradise. Sail fish and sword fish were seen but not taken, also many kinds of shark, dolphin, and great schools of porpoise. Of the many edible varieties we preferred Jordan's Cabrillo which is certainly a toothsome morsel when properly baked.

We headed the "Petrel" on up the Gulf and put into "Ensenada de los Muertos" for the afternoon tide. Among the sand dunes near the beach we saw nine mounds each marked with a rude weather-beaten cross marking the last resting place of some unfortunate seafarers. I suppose this

was the cause of the gruesome name of the place. A recent south-east storm or "chubasco" had torn off the outer end of the pier of the San Antonio Mining Company and strewn the piling along the beach for some distance. On these piles we found many *Chama, Vermetus,* and great oysters. Some of these were almost circular and nearly a foot in diameter. Among the sand hills back from the coast were many bleached shells of *Bulimulus sufflatus* Gld.; after much arduous labor a few live ones were found aestivating, buried under the dead leaves of the yucca and other desert vegetation. Continuing on up the coast we passed the west coast of Ceralbo Island and anchored in the delightful land-locked cove at the north end of Espiritu Santo Island lying just outside La Paz Bay.

In this charmed spot we passed two of the most productive days on the entire trip. The afternoon tides were extremely low. On our left for half a mile were scattered large coral heads which were gradually visible as the tide ran out. By breaking up these bunches of coral I was able to take my first living *Lima tetrica* Gld., a beautiful species much resembling the large ones from Florida. On my three previous trips to Mexico I had taken only a few odd valves, and this proved to be the only place I found that lovely species on the present expedition. Another interesting inhabitant of the coral heads was the tectibranch *Dolabella californica* Stearns, which exudes, on being disturbed, a purple liquid much like that of our *Aplysia.* These same tectibranchs were subsequently found thrown up by a recent storm on San José Island and Carmen Island in company with a multitude of star-fish.

Many fine large *Pinna tuberculosa* Sby. and *P. rugosa* Sby. were taken buried in the sand among the coral heads. In the sand bars at the head of the bay we gathered a large sack of *Macrocallista squalida* Sby. which made excellent chowder and cocktails.

I took my first live *Oliva porphyria* L. here under about three inches of sand; and believe me it is some thrill to dig these beauties from the sand. Thrill number three was a fine

live *Pitar pollicaris* Cpr. as large as the one in the collection of the Academy of Natural Sciences in Philadelphia. This seems to be one of the rarest of the Mexican bivalves. *Venus vulnerata* Brod., *Terebra, Polynices,* and *Olivella* were also plowing up these same sand bars which were exposed a quarter of a mile from shore at the extreme low tide.

(To be continued)

OBSERVATIONS ON MONTACUTA PERCOMPRESSA DALL

BY GEORGE M. GRAY
Curator of the Museum, Marine Biological Laboratory, Woods Hole

On August 25th of this year (1932) Mr. F. W. Wamsley, our veteran collector and preparator, brought to me four *Synapta inhaerens* (the sand holothurian), wanting me to look at the small molluscs which were attached to them—one to each Synapta.

He said that this was not the first time he had found these molluscs on the Synapta when digging for the latter. He and others had been out that morning digging Synapta for use at the Laboratory and these four were the only ones he noticed having the molluscs on them. I was delighted to get them. They proved to be *Montacuta percompressa* Dall.[1] As the Synapta were needed for other work I carefully removed each mollusc from its host and was surprised at the tenacity with which they stuck to the Synapta. By taking the mollusc with forceps or finger and thumb and gently lifting to separate it from the Synapta, I have sometimes raised the latter free from the water before the mollusc let go, so strongly was it fastened to its host, and one crushed in the forceps before removal. I kept them over night in a small dish of water. I had another dish with one or two *Tellina* in it and the next morning, thinking I would consolidate, I put the *Tellina* in with the *Montacuta.* Shortly after I noticed eggs

[1] This identification was confirmed by Dr. Pilsbry and Mr. Vanatta.

in the dish. Every indication was that these eggs were laid by the *Montacuta*. The molluscs lived a few days, but fearing I might lose them I finally preserved them. The foot evidently penetrated the outer wall, or skin, of the Synapta. When free from the latter they would extend the foot and crawl about. Frequently the foot extended out farther than the length of the shell. They were very active, continually thrusting out the foot, and in life showed a beautiful velum.

A few days after these were brought to me, I went to the same place from which these were collected and though I dug and sifted until my time was up, I secured only a few Synapta, without the *Montacuta* and none of the latter were observed at all. I was of course disappointed in not finding them. October 1st, I went to the Bay shore and dug several Synapta and found two, each of which had a Montacuta attached.

October 25th, I took another trip to the Bay shore to see if I could get Montacuta free and separate from Synapta. The tide was higher than on the previous trip and there was some ripple on the water, so that it was not so favorable a time for seeing the bottom. In smooth water, and also where the sand flats are bare, the little elevations of sand and the holes made by the Synapta can frequently be seen so that one can dig with a spade for Synapta with more assurance of success than with indiscriminate digging. However at this time the digging was done more or less at random and for nearly two hours. In two or three instances of this promiscuous digging I obtained two specimens of *Montacuta*, but in each case there was also one or more Synapta in the sieve with the *Montacuta*, so that it was almost impossible to decide whether they were originally on the Synapta or loose in the sand.

It must be borne in mind that in all this collecting I dumped each spadeful into a fine wire sieve and carefully sifted the material. The *Montacuta* might have loosened from their host by sifting or might have been loose in the sand.

On October 31st I went again to the Bay shore for *Montacuta*. The tide was very low and the flats were mostly out of

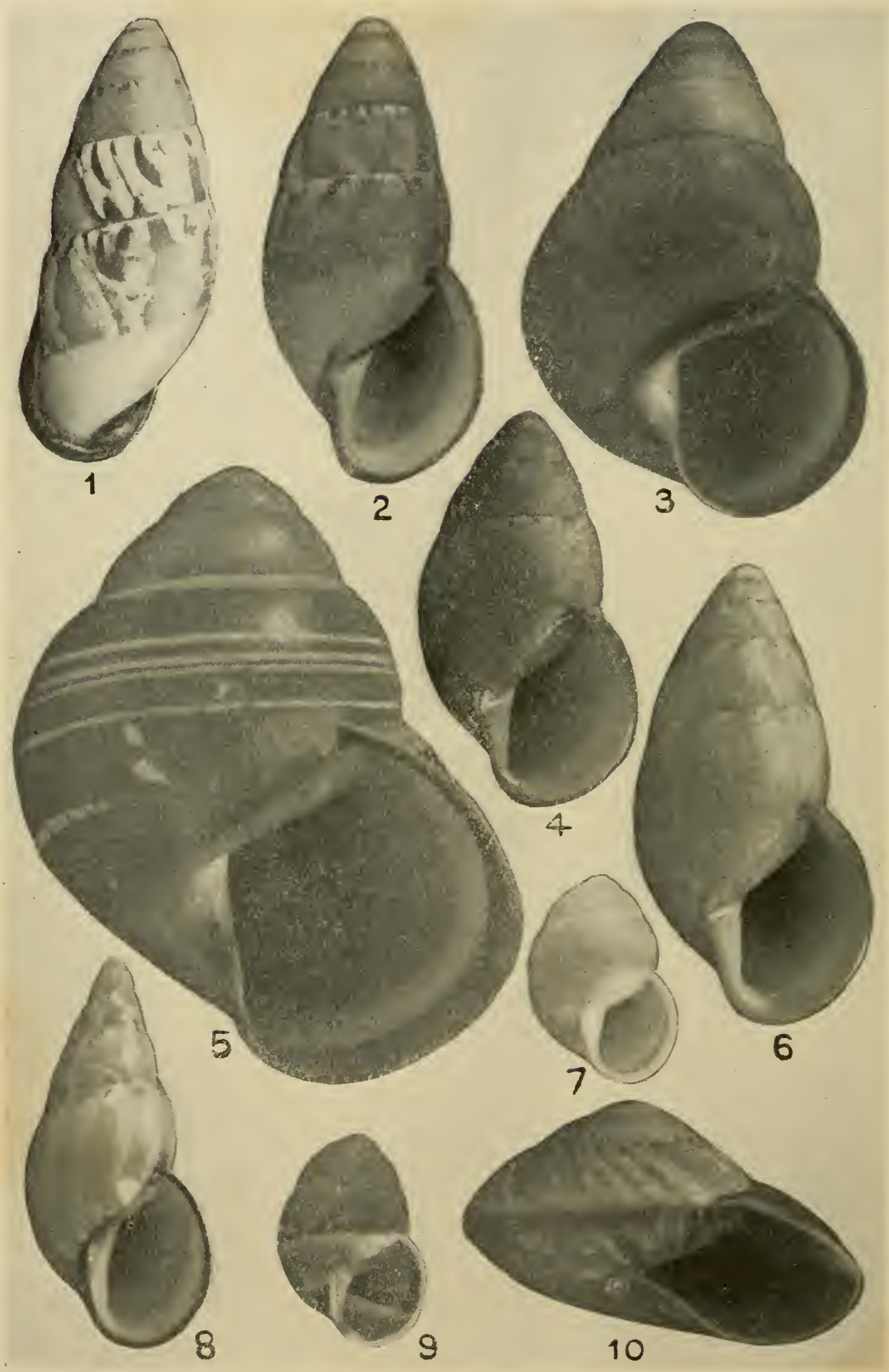
water. Digging and sifting was carried on until too tired to work longer and the only *Montacuta* obtained were two which were found attached to Synapta, one to each. It was noticed that one of these was attached as much as two inches below or behind the head end of its host and as the Synapta was nearly perpendicular in the sand, *Montacuta* was at least two inches below the surface of the sand. Synapta has more or less of a burrow and this would apparently give *Montacuta* greater freedom, and prevent suffocation. I think there are times when it may be deeper. In spite of all the digging done in this area, I have no conclusive proof that *Montacuta* is free, loose, and separate from Synapta, though I cannot see why it should not be.

All of the *Montacuta* thus far brought in have to the best of my knowledge been attached to this sand holothurian, *Synapta inhaerens* (O. F. Müller)—*Leptosynapta girardii* (Verrill).

A few times I have tried putting a Synapta in with *Montacuta*. Sooner or later they would be found adhering to the former and one time three were attached to the same host.

The places where most of the Synapta have been taken by our collectors and where *Montacuta* has been found attached are generally sandy flats without much, if any, mud mixed in, though it is perhaps possible that they may be found in more or less muddy sand; but usually in quite clear sand, from between tides to beyond low tide mark, and many times these flats are entirely out of water.

Verrill in his "Invertebrates of Vineyard Sound and Adjacent Waters," 1874, mentions *Montacuta elevata* as occasionally occurring on shelly bottoms, but were seldom obtained alive. Pratt in his "Invertebrate Animals" does not mention *Montacuta* at all, that I can see. Johnson in his list of Mollusca published in 1915 says, "Mass.,—"at the 'Gutters' Naushon Island, near Woods Hole." Sumner, in his "Biological Survey," 1911, seems to have quoted from Verrill thus,—"Gut of Canso and 'gutters' of Naushon in sand and mud *below* low water mark." Gould and Binney mention *M.*



1, 2, Helicostyla mcgintyi Sm. 3, H. pithogaster batoana Sm. 4, 6, H. c. calawaganensis Sm 5, H. t. sulana Sm. 7, Camæna oomorpha demesana Sm. 8, Helicostyla virgata maxwellsmithi McGinty. 9, Camæna amatangana Sm. 10, Rhysota l. globosa Sm.

elevata as being taken at New Bedford Harbor, but nowhere have I yet found it mentioned as being found attached to Synapta; and we, so far as I know, have never taken it except on Synapta. At the same time, one may dig a number of Synapta and not find *Montacuta*. If I were sent out to collect *Montacuta* I should certainly go where Synapta was common or abundant.

TWO NEW SPECIES OF MONADENIA FROM NORTHERN CALIFORNIA

BY G. DALLAS HANNA AND ALLYN G. SMITH

Collections made during recent years have contained representatives of two species of *Monadenia* that cannot be identified with any of the known forms. The first is widely distributed in the northern part of California but the second is known only from Samwel Cave and Potter Creek Cave in Shasta County, where it was associated with numerous Pleistocene mammals in a state of preservation that shows the two groups were contemporaneous. The cave fauna was investigated several years ago by parties from the University of California and we are indebted to Messrs. E. L. Furlong and C. L. Camp for the privilege of describing the shells.

MONADENIA CHURCHI Hanna & Smith, n. sp. Plate 5, figs. 1-5; plate 6, fig. 8.

Shell medium sized, non-carinate, umbilicate; with a somewhat low spire; whorls 5¼, evenly rounded; outer lip slightly reflected; color pale brown, with a peripheral band of darker brown than the rest of the shell bounded above and below by light cream-colored bands, the upper about equal in width to the dark band, the lower a little wider; nuclear whorls 1⅓, sculptured with densely set, wavy, somewhat elongated tubercles arranged roughly in spiral order; remaining whorls with sparse elongated tubercles, grouped principally in a protractive spiral order, more pronounced on the upper surface, becoming obsolete on the lower surface

and in the umbilicus. Extremely fine, wavy, axial sculpture is pronounced on the postnuclear whorls and is superimposed on the somewhat irregular, low, axial growth-ridges, but does not extend to the top of the tubercles. This sculpture gives the shell a moderately smooth, dull appearance when viewed without a lens.

Holotype: No. 5806 (Calif. Acad. Sci. Type Coll.), from 2.1 miles East of Payne's Creek Station, Tehama County, California; Allyn G. Smith collector, February 21, 1931; one paratype and 16 additional specimens were collected at the same place in a well-shaded lava rock-slide; these are No. 3729 of Mr. Smith's collection. Paratype: No. 5807 (C. A. S. Type Coll.), from "Deer Creek, Tehama County, California"; E. W. Gifford, collector, November 2, 1914.

The following material has been examined:

Lava rock-slide, 2.1 miles East of Payne's Creek Station, Tehama County, California; A. G. Smith, collector, Feb. 21, 1931; No. 3729 (A.G.S.) ; 18 adult and 10 young and broken specimens; six of the adults were living when found. Type lot.

Near Butte Creek, Tehama County, California, 22 miles East of Chico on the road to Butte Meadows; A. G. Smith, collector, Feb. 22, 1931; No. 3865 (A.G.S.) ; one immature specimen.

Deer Creek, Tehama County, California; E. W. Gifford, collector, Nov. 2, 1914; No. 20025 (C.A.S.) ; one specimen. Paratype.

Shasta County, California; J. A. Kusche, collector; No. 21908 (C.A.S.) ; one broken specimen.

Grass Valley Creek, Trinity County, California, 4 miles West of summit (county line) on the Redding-Weaverville highway; G. D. Hanna, collector, June, 1931; No. 25652 (C.A.S.) ; two broken adult specimens, one alive.

Cedar Creek, 6 miles East of Ingot, Shasta County, California; G. D. Hanna and J. L. Nicholson, collector, July, 1929; No. 24120 (C.A.S.) ; four badly weathered and broken shells.

Trinity Alps Camp, Stuart's Fork of the Trinity River, 12 miles Northeast of Weaverville, Trinity County, California; G. D. Hanna, collector, June, 1931; No. 25674 (C.A.S.) ; four dead specimens, three of which were broken.

These various lots have the following measurements, in mm.

Number 3279 (A.G.S.), Payne's Creek.

Diam.	Alt.		Diam.	Alt.
20.0	11.3	Holotype	18.3	10.8
19.7	11.0	Paratype	18.3	9.7
18.6	10.4		20.8	11.5
18.3	10.5		20.0	11.1
19.2	11.1		20.3	11.5
19.4	10.6		18.0	9.7
17.8	10.8		19.6	10.8
19.5	11.2		19.7	10.7
18.7	10.4		19.1	10.5

No. 20025 (C.A.S.), Deer Creek, paratype.

23.5	13.6

No. 21908 (C.A.S.), Shasta County.

20.7	11.0

No. 25652 (C.A.S.), Grass Valley Creek.

21.9	14.0

No. 25674 (C.A.S.), Stuart's Fork, Trinity River.

22.6	13.5
20.3	11.6
20.7	11.4

The species has a fairly wide distribution in north-central California. It has been found chiefly in rock-slides but a few specimens were collected under forest debris in heavy shade. In the series examined the diameter ranges from 17.8 mm. to 23.5 mm.; the altitude ranges from 9.7 mm. to 14.0 mm.

In many living adult specimens the epidermis, apparently very thin, is badly eroded on the spire. As a result few mature shells in first class condition were found. The tubercles are usually elongate in a protractive spiral direction but do not have any regular arrangement otherwise. The tops of the tubercles are polished and do not bear hairs in most of the individuals examined, but in some of the specimens from Trinity County there is evidence of short blunt extensions of the epidermis in the umbilical region; these do not leave a pit or other mark on the tubercles when they are removed or absent. The shape of the tubercles is usually elongate spirally but this is subject to considerable variation even on the same specimen, some of them being round or pear-shaped.

The material at hand gives evidence of the existence of

several different races, each with minor variations that are not sufficiently pronounced to warrant describing them as subspecies. The paratype from Deer Creek is the largest and heaviest shell so far found. It differs from the type and from the others in the type lot by its larger size, somewhat lighter color, more reflected lip, and more thickly set tubercles, which are strong on the base and in the umbilicus as well as on the upper surface. Specimens from Trinity County are darker in color than those in the type lot and the tubercles are crowned sometimes with minute fin-shaped projections of the epidermis.

Specimens from the type lot have been placed in the collections of the United States National Museum, the Philadelphia Academy of Sciences, and in the private collections of S. S. Berry and E. P. and E. M. Chace. Named for Mr. Clifford C. Church, who has rendered able assistance on many field trips.

Notes on anatomy.—The individual that was dissected had started to form the outer lip of the shell but this was not complete; on account of this immaturity it is possible that the various organs had not reached their full size and proportions. The presence of the single unbranched mucous gland on the dart sac (Plate 6, fig. 8) proves conclusively that the species should be allied with the group *Monadenia,* as defined by Dr. Pilsbry.[1] He illustrated the genitalia of *fidelis,* the type of the genus[2] and we have investigated *infumata,* which agrees in all essential characters. Details differ among the several species as would be expected but none of them have the branched mucous gland, which seems to be characteristic of *Helminthoglypta.*

The mantle of *M. churchi* has a series of jet-black irregularly-shaped spots, sparsely arranged over the surface. The jaw has seven heavy ribs. There are 24 rows of teeth on each side of the central and the first laterals have a small cusp on the inner side.

To this time four species have been found to belong defi-

[1] Pilsbry, H. A., Manual of Conch., ser. 2, vol. 9, 1895, p. 198.
[2] Op. cit., pl. 59, fig. 81.

nitely to *Monadenia*. These are *fidelis, infumata, mormonum,* and *churchi*. In addition, the new species *troglodytes,* to be described later, probably belongs to the same group. Some others, especially those that belong to the large *mormonum* assemblage, are expected to fall into the genus also.

In order that a direct comparison may be made with a member of the genus *Helminthoglypta* a drawing of the genitalia of *H. cypreophila* (Newcomb) is furnished (Plate 6, fig. 9). The animal that was dissected for this last drawing came from 1 mile west of Columbia, Calaveras County, California, and was collected in 1930 by the writers. In extracting the soft parts from the shell the body was broken in two near the base of the mantle cavity and as a consequence the distal parts of the genital organs are missing. The anatomy presents some puzzling features. The penis system is elongated to such an extent that the retractor muscle is reduced in length to not over one millimeter, and serves merely as an attachment of the penis to the floor of the mantle cavity. Much farther back on the penis, the long flagellum is attached and the vas deferens is also attached at this latter point. The spermatic duct is very long, a flagellum-like branch being attached at about its lower third. In the animal dissected this duct was free. The spermatic duct was attached to the oviduct toward the lower end and this, in turn, was attached to the vagina near the opening to the exterior. The penis was attached at the same point. A large sac-like cloaca had the short dart-sac on the upper end and to this was attached the common duct of the two mucous glands. The glands themselves were large and spindle-shaped, and seemed to be filled with a yolk-like material. At the upper end of each gland a short tube led to a large irregularly-shaped pouch containing many folds. In one of the tubes were three small spherical bodies having the appearance of eggs. The essential details of *cypreophila* are therefore seen to agree with *Helminthoglypta* and not with *Monadenia*.

Incidentally it may be recorded that the necessary dissec-

tion for differentiating these two genera is quite simple and may be done under an ordinary dissecting microscope. It is necessary merely to ascertain whether the mucous gland is single or double, an operation that requires but a few minutes. It should be performed for more of the large California land snails.

MONADENIA TROGLODYTES Hanna & Smith, n. sp. Plate 5, figs. 6-8.

Shell light buff, medium size, widely umbilicate; spire greatly depressed; whorls 5½ with moderately deep suture; the last whorl slightly depressed near the aperture; outer margin expanded very little, the basal margin somewhat more so; one narrow pale brown spiral band appears just above the periphery, which is bounded above and below by white bands that are slightly wider; surface without markings except growth lines; nucleus consisting of 1½ whorls marked by radiating wavy riblets. Diameter 24.2; altitude 10.8 mm.

Holotype, No. 32394 (University of California, Dept. of Paleontology), from Samwel Cave, Shasta County, California; pleistocene. Paratype No. 5842 (Calif. Acad. Sci. Type Coll.), from the same locality.

The above is a description of the holotype, which, with the other specimens found, is in a semi-fossil state and completely denuded of the epidermis. Variation in size is shown by the series of measurements of specimens examined, which follows:

No.	Diam.	Alt.	No.	Diam.	Alt.
1008	24.2 mm.	10.8 mm.	1055	21.6 mm.	10.1 mm.
1008	22.5	10.6	1055	27.5	11.3
1008	26.2	12.0	1055	24.5	11.4
1008	25.0	11.7	1055	23.9	11.3
1008	24.1	11.5	1055	24.6	11.3
1008	23.8	10.5	1055	22.9	11.0
1008	26.3	13.0	1055	23.8	11.0
1008[3]	25.0	11.6	1055	24.8	11.3
1009	22.3	9.8	1055	26.2	12.3
1009	25.3	12.0	1055	24.9	11.1
1055	23.0	11.5	1055	24.6	11.3

[3] Paratype, C.A.S.

No. 1008 (U.C.), Samwel Cave, Ch. 1, Sec. 2-5. No. 1009, Samwel Cave, in gravel slope filling grotto at South end. Ch. 2, Sec. 4. No. 1055, Potter Creek Cave. "Past kitchen."

In the excavation of Samwel Cave the chambers were divided into sections and an accurate record was kept of exact locations and depths of the various specimens collected. (See report by Furlong referred to below.)

The diameter varies from 21.6 mm. to 27.5 mm., and the altitude from 9.8 mm. to 13.0 mm. This is exceptional uniformity for such a series of California land shells. All of the shells are greatly depressed, the most extreme specimen being almost planorboid.

Some of this series of shells were examined several years ago by one of us (G. D. H.) at the request of Mr. Eustace Furlong, when they were thought to belong to *M. mormonum* (Pfr.). Since then we have obtained abundant material of this species from Mormon Island, the type locality, and a comparison shows at once that the cave shells are decidedly different. The most noticeable characters of the latter are the greatly depressed spire and the wide umbilicus. In these respects *M. circumcarinata* (Stearns) is suggested although there is a complete absence of the strong ribs so characteristic of that form.

Locality Information.—An interesting account of the discovery and exploration of Samwel Cave has been given by E. L. Furlong.[4] The cave is located in carboniferous limestone in Shasta County, California, along the East bank of the McCloud River, 16 miles above its mouth. Potter Creek Cave is in the same county and Wm. J. Sinclair has given an account of the exploration of it.[5]

In neither account is there a statement regarding the presence of land shells but Mr. Furlong has informed us verbally that in Samwel Cave there was no question but that the shells were in the same stratum with the bones. This of course is

---

[4] Furlong, E. L., The Exploration of Samwel Cave. Am. Jour. Sci., ser. 4, vol. 22, 1906, pp. 235-247, 3 text figures.

[5] Sinclair, Wm. J., The Exploration of the Potter Creek Cave. Univ. Calif. Publ. North Am. Arch. & Eth., vol. 2, No. 1.

borne out by the fact that the species is extinct. There is abundant evidence from mammalian remains that the caves were more or less freely accessible to animals from the outside during the long period of the Pleistocene.

Explanation of Plates 5, and 6

Plate 5, Figs. 1, 2, 3. *Monadenia churchi* Hanna & Smith, n. sp. Holotype No. 5806 (C. A. S.) from 2.1 miles East of Payne's Creek Station, Tehama County, California. Diameter 20.0 mm.; altitude 11.3 mm.

Figs. 4, 5. *Monadenia churchi* Hanna & Smith, n. sp. Paratype. No. 5807 (C. A. S.) from Deer Creek, Tehama County, California. Apex and part of upper side of body whorl, enlarged about ×15 to show details of sculpture. Diameter 23.5 mm., altitude 13.6 mm.

Figs. 6, 7, 8. *Monadenia troglodytes* Hanna & Smith, n. sp. Holotype No. 32394 (Univ. Calif. Dept. Paleo. Coll.) from Samwel Cave, Shasta County, California. Pleistocene. Diameter 24.2 mm., altitude 10.8 mm.

Plate 6, Fig. 8. *Monadenia churchi* Hanna & Smith, n. sp. Genitalia of specimen from type lot, 2.1 miles East of Payne's Creek Station, Tehama County, California.

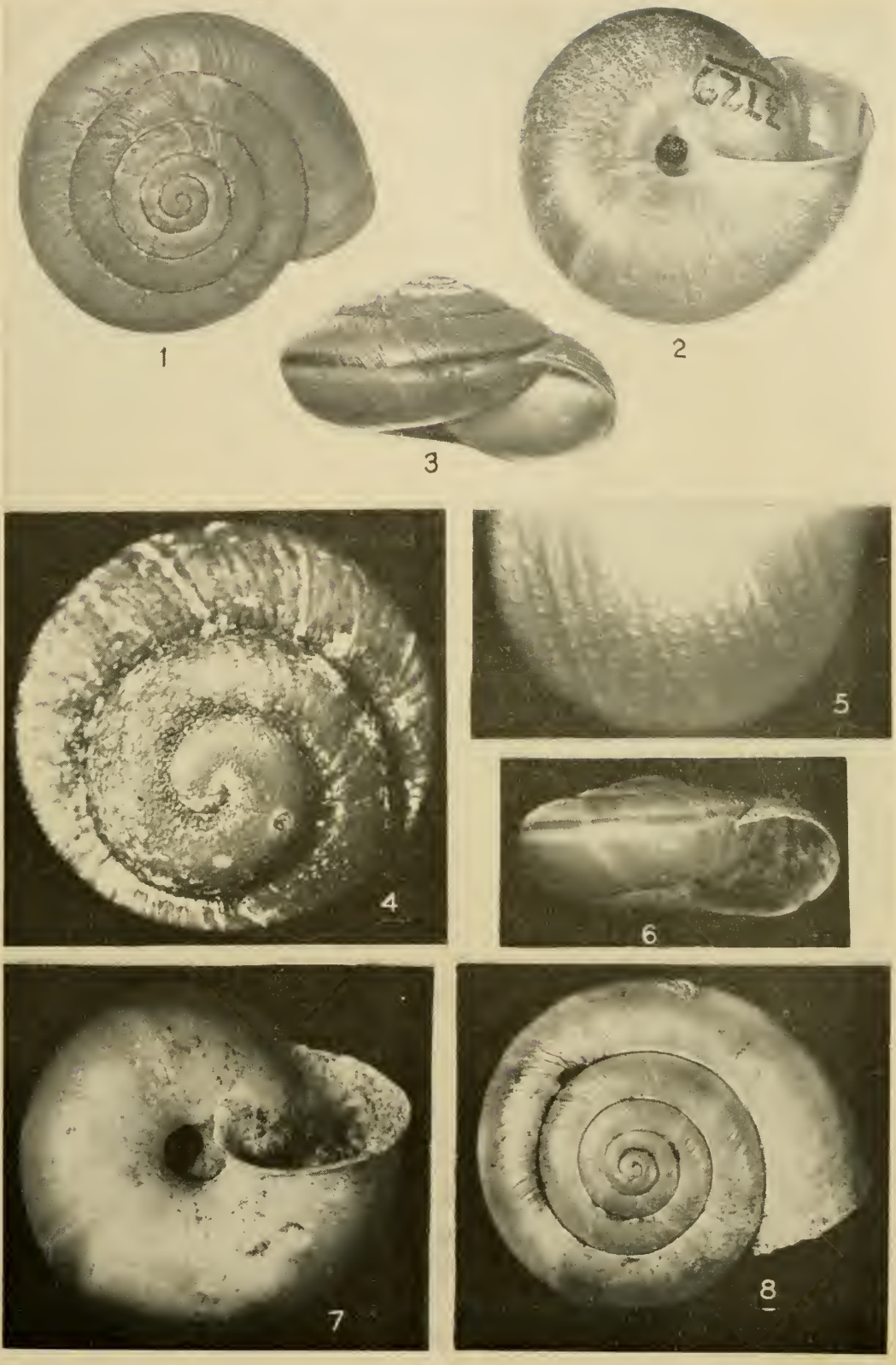
Fig. 9. *Helminthoglypta cypreophila* (Newcomb). Genitalia of specimen from 1 mile West of Columbia, Calaveras County, California.

TWO NEW LAND SHELLS FROM THE SOUTHERN APPALACHIANS

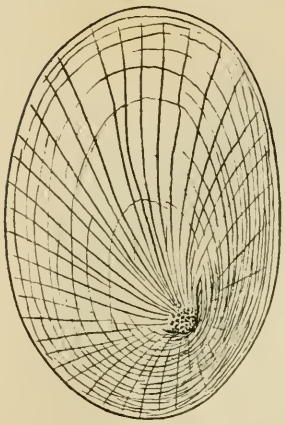
BY W. J. CLENCH AND A. F. ARCHER

The following report contains descriptions of the new land shells obtained during the past summer as well as a list of all the land mollusks collected at Mt. LeConte in the Great Smoky Mountains of Tennessee.

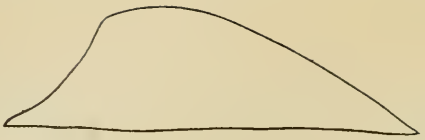
This field trip was made as part of a general survey of the southeastern states, first undertaken by the senior author under the auspices of the University of Michigan and since continued by the Museum of Comparative Zoology with financial aid from the University of Michigan, the Academy



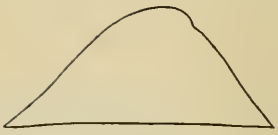
Figs. 1–5. Monadenia churchi Hanna & Smith.
Figs. 6–8. Monadenia troglodytes Hanna & Smith.



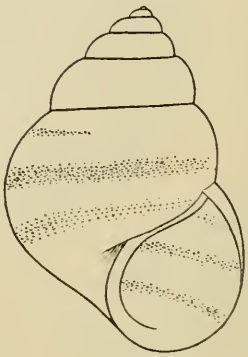
1



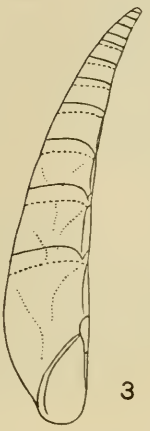
1a



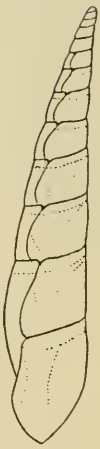
1b

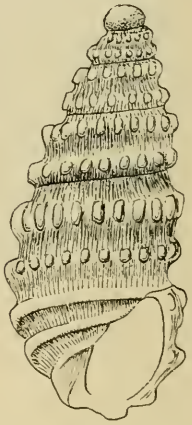


2

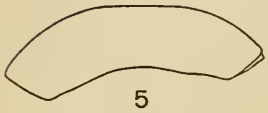


3

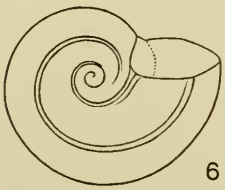




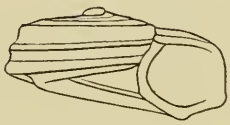
4



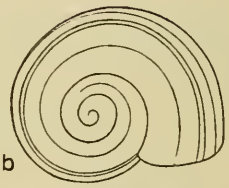
5



6



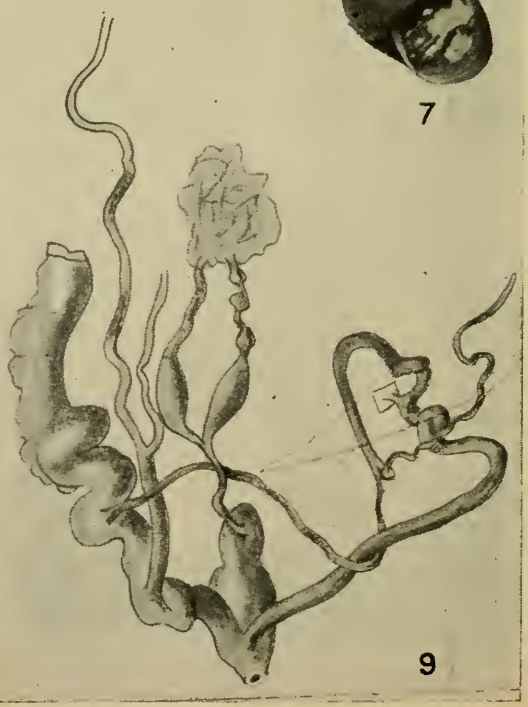
6a



6b

8

7



9

1, Hebetancylus cubensis Pils. & Aguayo. 2, Hydrobia torrei P. & A. 3, Melanella bermudezi P. & A. 4, Odostomia (Miralda) havanensis P. & A. 5, Meioceras constrictum P. & A. 6, Circulus cubanus P. & A. 7, Conulinus cockerelli Pils., Durban, Natal. 8, Monadenia churchi Hanna & Smith, 9. Helminthoglypta cypreophila (Nc.)

of Natural Science of Philadelphia and the various students who have participated in the several surveys. The results of these expeditions will not be published in a single report but will appear in independent papers by various people interested in specific groups of mollusks.

Three important regions were investigated. The area in northeastern Alabama was studied primarily to add long series of topotypes of several species described from Huntsville and Woodville, Alabama. These places are on the southern fringe of the Cumberland plateau, in a territory rich in limestone. It is a mountainous area, the tops of the mountains usually capped with sandstone, below which lie the massive limestone outcrops. North of this dissected area the land is elevated into the sandstone plateau.

The second area studied was that of east central Alabama in the vicinity of Choccolocco Mountain. This region is drained by several small tributaries of the Coosa River, and until the present trip had never been investigated. Several collections of Pleurocerids were made in the many springs and creeks especially about Anniston and Jacksonville.

Collections were made of land shells at Mt. LeConte in the Great Smoky Mountains of eastern Tennessee as little was known of its mollusk fauna. The territory in Tennessee and North Carolina, north and east of Mt. LeConte is practically unexplored conchologically. Only two mountain peaks have been at all seriously studied, namely Mitchell and Roan. Very little is known about the region south of Thunderhead in the lower Smokies. The distributional limits of many species characteristic of this mountain region can only be guessed at.

The authors are deeply grateful to Postmaster J. R. Kennamer of Woodville, Alabama, and to Mr. T. H. Wade and Mr. W. T. Williams of Huntsville, Alabama, for many favors and for much information about their regions.

It was a delight to us to find that both Sargent at Woodville and H. H. Smith at Huntsville were remembered by several of the older inhabitants.

POLYGYRA (TRIODOPSIS) SANA, sp. nov. Plate 7, figs. 4-6.

Description: Shell umbilicated, depressed globose, thin. Color of yellowish horn with a slightly reddish tone on the body whorl of some specimens. Peristome nearly white. Whorls 5-5¼, quite convex, especially the body whorl. Spire somewhat elevated. Aperture lunate. Peristome expanded, smooth and merging into a short broad columella, widening where it joins the parietal wall. Parietal wall smooth with a very thin callus. Suture impressed. Nuclear whorl smooth, succeeding whorls covered with axial riblets, the later whorls, especially the body whorl, are crossed by fine incised lines. The whole shell possessing a shining appearance.

Height	Maj. Diam.	Lesser Diam.	Ap. Height	Ap. Width	
11.9 mm.	19.4 mm.	16.8 mm.	6.0 mm.	8.0 mm.	Holotype
12.9	20.6	17.4	6.5	8.3	Paratype
12.9	19.5	16.0	5.2	7.4	Paratype
12.4	18.5	15.4	5.2	7.3	Paratype
11.3	17.5	14.4	4.9	6.7	Paratype

Height-diameter index 63.

Holotype: M. C. Z., No. 95089. (34° 45′ N.-86° 31′ W), slopes of Big Cove, Monte Sano, Huntsville, Madison Co., Alabama, Clench and Archer collectors, July, 1932. Paratypes in the M.C.Z., the A.N.S.P. and the collection of A. F. Archer.

Remarks: This species is most nearly allied to *P. clausa* (Say). It is more depressed than *clausa* and the whorls are less rounded. The umbilicus is wider so that some of the upper whorls are visible. The peristome is wider, flatter and more expanded. In sculpture our species differs in having more strongly incised spiral lines and a shinier surface. This species can be compared with *P. thyroidus* (Say) in the following respects: The shell is more depressed; the peristome is narrower, thicker and less sharply edged; the umbilicus is more open; no parietal tooth is present; the axial riblets are more strongly raised, while the spiral lines are less deeply incised. This species so far as known is confined to the northeastern section of Monte Sano in the region of the Big Cove.

Habitat: Under leaves at the bottom of limestone ledges.

POLYGYRA (STENOTREMA) TURBINELLA, subsp. nov. Plate 7, figs. 1-3.

Description: Shell imperforate, globose and quite thin. Color of shell chestnut brown; parietal tooth creamy yellow tinged with reddish brown; inner edge of peristome of same color, but gradually shading into a dull brown along the outer edge. Whorls 5½ to 5¾, slightly convex; body whorl strongly convex and rounded. Basal area only slightly rounded. Spire very moderately elevated and convex. Aperture transverse, slightly curved and constricted by a slightly curved parietal tooth. Peristome entirely free from the parietal lamella. Outer rim of the peristome rather thin where it joins the body whorl, becoming thinner at the outermost point of its curve and then becoming abruptly thickened by a deeply set, rounded denticle. A small sinus separates this denticle from a large callus along the inner margin of the basal area of the peristome. The callus bulges in toward the parietal tooth but bears a rather wide and deep basal notch. In the columellar region the inner margin of the peristome is cut back and separated from the parietal tooth by a deep indentation. The parietal tooth is large and projecting, curving slightly into the aperture at its outer end. A slight buttress projects from it toward the point where the outer rim of the peristome joins the body whorl. A definite and prominent tooth-like bulge produced on the inner margin of the outer lip contrasting with the well defined anal sinus. Internal lamella nearly straight, the blade curving outward slightly, thicker at the top where its edge leans a little toward the aperture, but thinner at its base. Suture very slightly impressed. Sculpture on the nuclear whorls consisting of incised axial lines which become weaker on the succeeding whorls, the rest of the shell being covered with rather closely crowded light colored hairs. Peristome and parietal tooth covered with microscopic beads.

Height	Maj. Diam.	Lesser Diam.	Ap. Length	
6.5 mm.	9.6 mm.	8.8 mm.	4.7 mm.	Holotype
6.1	9.2	8.7	4.4	Paratype
6.3	8.7	8.1	4.5	Paratype
6.0	8.8	8.2	4.4	Paratype
6.2	8.9	8.6	4.6	Paratype
6.4	8.7	8.1	4.2	Paratype

Height-diameter index 67.

Holotype: M. C. Z., No. 95140. (34° 39′ N.-86° 15′ W.), 2-4 miles east of Woodville, Jackson Co., Alabama. Clench and Archer collectors, July, 1932. Paratype, M.C.Z., A.N.S.P. and the collection of A. F. Archer.

Remarks: This variety differs from typical *P. stenotrema* (Fér.) chiefly in the aperture. The basal inner margin of the peristome bulges in toward the parietal tooth so that the callus on either side of the notch is in the form of a rounded bifurcated tooth, while in *P. stenotrema* this inner margin either curves in very slightly or not at all. While the notch in *P. stenotrema* varies in size, the callus on either side is in the form of very small and rather sharp teeth or else, as is more often the case, lacks these projections entirely. A second important difference is that while in *P. stenotrema* the parietal tooth at its columellar termination overlaps the inner margin of the peristome which in its turn slants downward toward the central notch, there is no such overlapping in *P. stenotrema turbinella,* as a deep sinus separates the terminations of these two structures and the inner margin of the peristome slants upward toward the central notch. In addition, there is a strong development of a toothlike prominence just below the anal sinus. Otherwise in color and angularity of the body whorl it resembles smaller specimens of the typical species. On an average, it is smaller than *P. stenotrema* of the region further north although in the same locality the typical form is its exact counterpart in size. It is readily distinguishable from *P. stenotrema subglobosa* Pils., being smaller, more elevated, with a heavier tooth and more bulging inner basal margin of the peristome. It is dark in color instead of being almost white as is the case of typical forms of the latter subspecies. The internal lamella is like that of the straight species.

Habitat: It is found mainly in leafy humus, both in the woods and at the base of limestone ledges. It does not tend to crawl about on the ledges in any numbers during wet periods, apparently preferring the wet leaves.

In "The Terrestrial Shell-Bearing Mollusca of Alabama," (Univ. of Mich., Misc. Publication No. 18, p. 49, 1928),

Walker states that there were several well defined local races of *P. stenotrema,* but owing to his uncertainty as to the nature of the straight species, he left them under the same name. *P. stenotrema turbinella* was probably one of the forms to which he referred. A smaller form of our subspecies was collected at Keel Mt., Paint Rock, Jackson Co., Alabama, which measured 8.4 mm.

LIST OF MOLLUSKS COLLECTED AT MT. LECONTE, TENNESSEE

Polygyra altispira Pils.
Polygyra stenotrema (Fér.)
Polygyra pilula Pils.
Polygyra rugeli (Shutt.)
Polygyra tridentata (Say)
Polygyra palliata (Say)
Polygyra ferrissii Pils.
Polygyra appressa perigrapta Pils.
Polygyra wheatleyi (Bld.)
Polygyra clarkii (Lea)
Polygyra chilhoweensis (Lewis)
Polygyra normalis Pils.
Polygyra zaleta (Binn.)
Gonyodiscus perspectivus (Say)
Anguispira alternata carinata (Pils. & Rhds.)
Vitrinizonites latissimus (Lewis)
Retinella carolinensis (Ckll.)
Zonitoides arboreus (Say)
Paravitrea capsella (Gld.)
Ventridens elliotti (Redf.)
Ventridens acerrus (Lewis)
Mesomphix subplana (Binn.)
Mesomphix andrewsae (Pils.)
Mesomphix laevigata Beck
Haplotrema concavum (Say)

A NEW LIGUUS FROM FLORIDA

BY WILLIAM J. CLENCH

LIGUUS FASCIATUS WALKERI, subsp. nov. Plate 7, figs. 7-9.

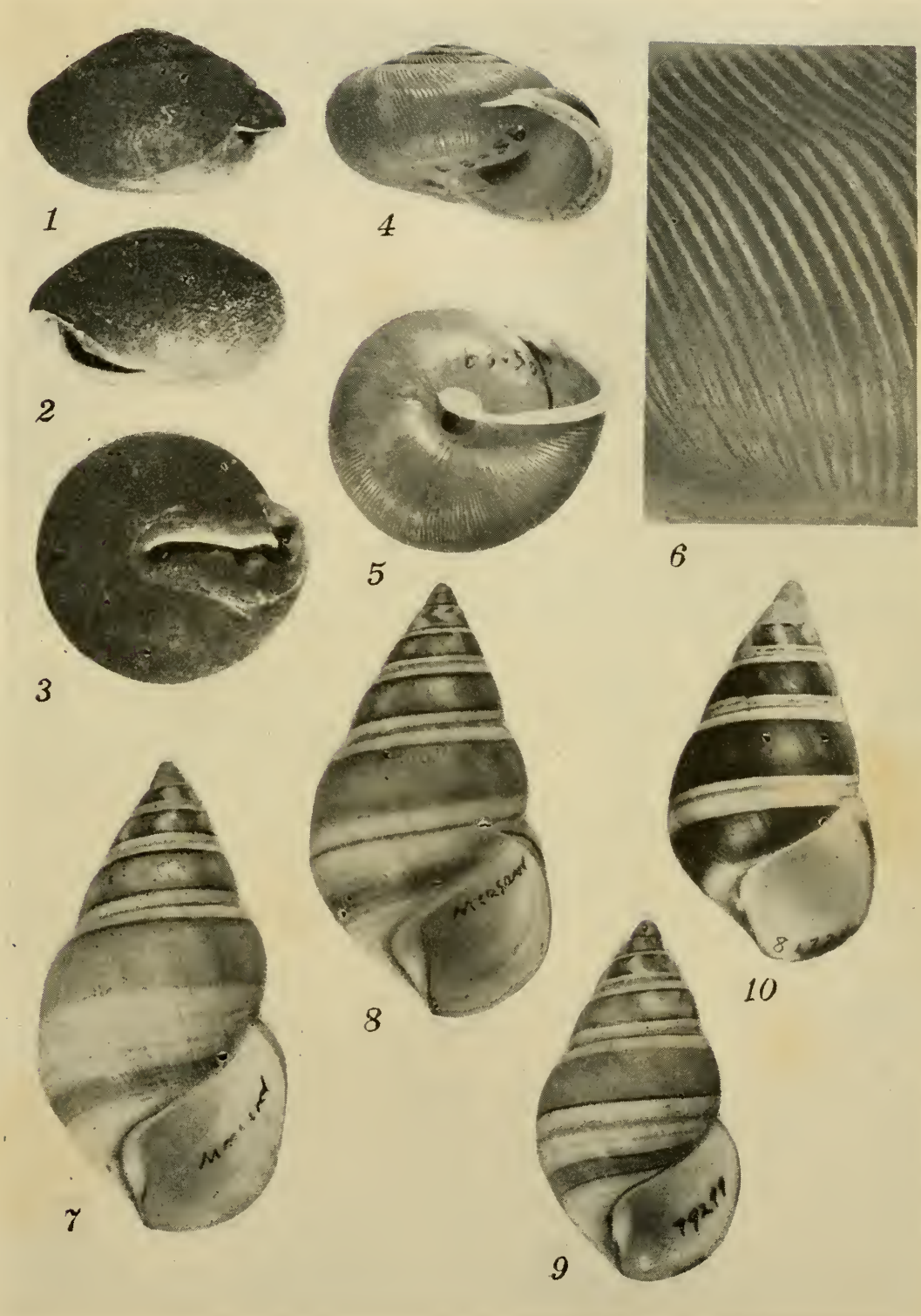
Shell rather solid, rather elongate, polished. Whorls 7 to 7½, quite convex. First three whorls deep pink. Columella slightly to heavily tinged with pink over white, twisted and occasionally truncated. Palatal lip usually emarginate. Parietal wall calloused, margined along its outer border with pink. Shell having a ground color of white other than on the first three whorls. A dark red-brown, rather narrow, spiral

band ½ to 1½ mm. is produced just below the periphery of the whorls. Above and below this band two broad zones are developed. The later whorls cover over the lower zone other than on the body whorl. The upper margin of each whorl usually encircles the preceding whorl along the narrow subperipheral line. A fine line of the same dark red-brown is also produced along the suture. The wide zones or bands are usually started on the earlier whorls (from 3 to 3½), by axial flames which become wider and then continue more or less as a solid band. The color is reddish brown at first, then gradually changing to bluish brown to bluish. The outer borders of the band are usually darker in color, from reddish blue-brown to bluish black. On many specimens, the area in between the darker borders of the band, especially on the last whorl, lose all color but a yellowish wash. On the earlier whorls this color is in evidence between the areas of bluish flames. The lower band is more persistent in retaining the darker colors, and generally follows to the aperture margin. There is usually present a series of fine green spiral lines that are invested in the peristracum. Sculpture of fine axial growth lines.

Length 45.5 mm., width 24.6 mm., aperture 21.4 mm., x 12.2 mm. Holotype.

Holotype: M. C. Z., No. 79299, Hammock No. 9 (Farnum number), Pinecrest region, central Everglades, Florida. Paratypes from the same and other hammocks in the immediate region.

Remarks: This color form is related to *L. fasciatus castaneozonatus* Pils. from the east and south coastal regions of Florida. It differs from that form in having more convex whorls, a heavier shell, and a different type of coloration. Its distribution so far as known is limited to the Pinecrest region. A comparative figure of *L. fasciatus castaneozonatus* Plate 7, fig. 10), exhibits most of these differences.



1–3. Polygyra turbinella Clench & Archer. 4–6. Polygyra sana Clench & Archer. 7–9. Liguus fasciatus walkeri Clench. 10. Liguus fasciatus castaneozonatus Pils.

Fig. 1. Two egg clusters of *A. gossei* on leaf and leaf stem, Sweet River, with broken shells. Fig. 2. Distribution of egg clusters of *A. fasciata* on cement of bridge over Rio Cobre Irrigation Canal. Fig. 3. View up the canal from bridge, egg clusters on masonry.

EGGS OF AMPULLARIA IN JAMAICA

BY E. A. ANDREWS
Johns Hopkins University

In July, 1932, Ampullaria was found in the parishes of Hannover, Westmoreland and St. Catherine in the west and central parts of the island of Jamaica, B. W. I.[1]

The first locality was in the Great River above the bridge at Lethe and just below ruins of an old dam: here, on July 9th, a single living Ampullaria was found under a large piece of rough limestone in mid-stream in water more than two feet deep, rushing rapidly and turbid. *Hemisinus lineolatus* was abundant near the top of stones and there were many *Nerita alticola* Pilsbry down deeper. The statements of a native living there leads one to suppose that Ampullaria may be abundant and easily obtained under stones when in dry seasons the water is low. This species is *Ampullaria fasciata* Roissy. In the condition of the river when seen both on the seventh and ninth there seemed no suitable places for the deposition of eggs.

The second locality was a peculiarly clear and rapid small stream apparently of constant flow, spoken of as part of Fresh River but evidently what is designated as Sweet River on maps. Here on July 14th several Ampullaria were taken from the bottoms of large rough stones of lime rock in water near waist deep in strong current as well as near shore amongst trash lodged in corners. As many as seven Ampullaria were found concealed and protected in cavities of the under side of one large stone.

Hemisinus lineolatus was abundant here near the surface and deep under stones were a few small dull *Neritina virginea* with their egg capsules.

None were visible at the surface but must be searched for upon submerged objects. Some empty shells were on shore

[1] These observations were made when in Jamaica to make an investigation aided by a grant from The National Research Council. The specimens mentioned are in the possession of The Academy of Sciences of Philadelphia and the species have been determined by Dr. Henry A. Pilsbry.

and some had apparently been broken at the apex and eaten out by rats or other animals; others were intact, but empty. Conspicuous egg clusters recalling lizard eggs in size and color were common on the stems and leaves of plants sending their two-feet long leaves up out of the water edge on stalks two feet high. One onlooker thought these were the eggs of frogs but another said they were eggs of snails; but also believed that small floating Azola was the seed of water-cress growing near by. Some of the eggs broken open were little advanced, others revealed well formed Ampullaria young; one in each; others had hatched.

These Ampullaria eggs were several to eighteen inches above the water so that the animals had crawled up that distance to lay the eggs in the air, the water level being apparently constant. Each cluster is of vertical rows generally two, sometimes three rows side by side with about seven in each row. Apparently the eggs are laid in pairs, right and left eggs being packed to make staggered series in two parallel rows. Each egg when advanced is somewhat elongated, being from 3½ by 4 to 4½ by 5 mm. Similar egg clusters were figured from the Florida Everglades by W. K. Brooks for *Ampullaria depressa* Say. but in that illustration the eggs, as found attached to reeds and grasses two to three inches above the water, are in at least five parallel vertical rows each of seven eggs in most rows.

These specimens prove to be the *Ampullaria gossei* Reeve, named from specimens got by Gosse, who found several Ampullaria alive with many egg clusters in a little rapid stream called Sweet River. He says the eggs "are laid for the most part in a double row, attached by a glutinous substance to the stalks and leaves of plants overhanging the water, but not immersed. The eggs are oval, shelly, pure white and nearly as large as sweet peas." He found the contents of some eggs well developed embryos with shells and opercula, while other eggs had not formed embryos.

Doubtless Sweet River of Gosse is the present Sweet River in which Ampullaria is found in 1932 and the exact region near the main road may well be the same that Gosse could so

easily find going from Bluefields, where he lived more than a year, to the nearest town, Savanna la Mar.

We infer the laying season is a prolonged one since Gosse found old and young stages April 5th while we found the same July 14th. The persistence of Ampullaria in this seemingly constant environment for 87 years is in strong contrast to the changes found in the Neritina fauna of many Jamaican rivers and ponds. On the main road near this locality we now note the 112 mile-stone reckoning from Spanish Town. As this species was apparently first found in this river and possibly may be restricted to it, it is of interest to note the peculiarity of the river's course and origin. It is variously represented on different maps, but on the Public Works maps by Colin Liddell, 2,698 miles to inch, 1888, corrected to 1926, the river emerges from a swamp near the ocean is three parallel little rivers, of which the Ampullaria locality is the western-most; they run about a mile each across great pastures to be joined by a small river from the hills and then to continue westerly and thence back again toward the sea which the combined river finally enters four miles from the apparent origin in the swamp. Possibly the waters of the swamp owe their origin to the Deans Valley River that vanishes in a sink scarce two miles to the northward of the swamp?

The third locality for Ampullaria and its eggs was found July 15th along the main road from Spanish Town to Bog Walk where some two miles out it crosses the Government Rio Cobre Irrigation Canal flowing on the right of the road some two miles from the great dam across the Rio Cobre, and before the canal branches into its forty-five miles of distribution. Here the canal is deep, wide, swift and turbid so that no Ampullaria were seen, but on the smooth cement retaining walls above the bridge many conspicuous white clusters of eggs showed that Ampullaria must be present as in some eggs the well formed Ampullaria were found. However, men working along the canal and people living in houses by its bank knew nothing of such shells, and the short handled net failed to produce any. A few empty shells were found

on the shore and finally deep down under base of cocoanut tree on waters edge above bridge several living *Ampullaria fasciata* Roissy, were found and more below the bridge in small side ditches.

Egg clusters were also abundant upon the cement abutment of the bridge, Figure 2. These egg clusters seemed longer than those of *A. gossei* and more thickly crowded due to their being spread out upon one surface and not scattered here and there upon separate leaf stalks as in *A. gossei.* The clusters stood from one to fifteen inches above the water level which seemed to be generally constant and were often but a few inches apart. Some fifty clusters are represented in the area shown in Figure 2, each made of two or sometimes three parallel rows of seven or more eggs laid as in pairs and packed rather regularly side by side with many interruptions or exceptions. The egg rows run prevailingly nearly vertical. In some clusters the same number of eggs run all in one long zigzag row as if made of the usual two rows of seven to ten or so now laid singly. There seems a tendency to lay usually one egg left and one right with slow progression so that the two are packed diagonally side by side; but sometimes with more rapid progression the eggs may lie more nearly in one straight line.

These eggs were in different stages of development, in some clusters being advanced to well-formed shells.

As this canal comes from the Rio Cobre River search was made for Ampullaria in that river above and below the bridge spanning it about two miles above the canal mouth but none were found; yet Dr. Pilsbry records this species as having been found at Bog Walk which is three or four miles further up the river where the large branch, Rio Pedro, enters from the east. Search along this branch to the east was also without success.

References

1851. Gosse, P. H. A Naturalist's Sojourn in Jamaica. London.

1908. Brooks, W. K. and Bartgis, McGlone. The origin of

the lung of Ampullaria. Papers from the Tortugas Laboratory, Carnegie Institution of Washington, pp. 97-103, pls. 1-7.
1927. Pilsbry, H. A. A revision of the Ampullaridae of Jamaica and Cuba. Proc. Acad. Nat. Sci. Phil., LXXXIX, pp. 247-253, pls. XXL-XXLI.

OBSERVATIONS ON STAGNICOLA KINGI (MEEK), LIVING AND EXTINCT

BY RALPH V. CHAMBERLAIN
University of Utah

When R. Ellsworth Call in 1884 described his *Lymnaea utahensis* he undoubtedly had living specimens from Utah Lake, for he lists it among the recent Mollusca of the Bonneville Basin and refers to its dentition as differing "very materially" from that of *Radix ampla*, of which he regarded it as a variety. No subsequent collector, however, has heretofore recorded finding it alive, in spite of repeated searches, and the question has often been raised in recent years as to whether it may not have become wholly extinct. The answer was definitely given several years ago when the writer with a party of students found it still living in numbers in Utah Lake. It has since that time been taken by us whenever desired at the same locality.[1]

This locality is a stretch of shore about a quarter of a mile long on the west side of the lake a short distance south of the promontory locally known as Pelican Point. Here a number of springs empty into the lake, some of these bubbling up through the mud under the water, others arising near or above the water level. The snails were found in the springs and along the currents of fresher water flowing from them, many occurring under submerged or partially submerged rocks. They were not found living except in these places in and adjacent to the springs, indicating that the

[1] More recently we have also taken living specimens of *S. kingi* from Conner's Spring, north of Great Salt Lake, agreeing in all essential features of radula and shells with the Utah Lake form.

lowering of the lake in recent years and the resulting increase in salinity may be the cause of its impending extinction. No unusual difficulty has been experienced in rearing the species from eggs either in balanced aquaria or in those supplied with ordinary tap-water in the laboratory. They thrive on lettuce of which they seem to be fond.

The problem of working out the anatomy and embryology of the species was assigned to two of my graduate students, Elmer Berry and Edward Lowrance, whose reports will appear in due course of time. The anatomy shows agreement with *Stagnicola,* as represented by *S. palustris nuttalliana* (Lea), in the essential generic features of radula, genitalia and other internal parts. As to the specific name, no ground is found for separating the Utah Lake and other recent specimens from the Pliocene species described by Meek as *Lymnaea* (*Polyrhytis*) *kingi* (U. S. Geol. Exploration of the Fortieth Parallel, 1877). Comparisons have been made with topotypes and with a squeeze of Meek's holotype in the National Museum, kindly supplied by Dr. Bartsch, without finding tangible grounds for the separation.

The species has apparently lived continuously in the Utah region since Pliocene times. Specimens taken in Pliocene deposits at various points in Utah and Idaho indicate that the species was widespread and common in the period during which they were laid down in lakes that formerly occupied areas in Cache and Malad valleys and the valley of the Bear River from the region now occupied by Bear Lake along the river into Idaho and back south to the southern end of Gentile Valley and adjacent parts. In Pleistocene times it continued to be a widespread and abundant species throughout the existence of Lake Bonneville, being a characteristic form in the strata deposited in that lake from lowest to uppermost, as well as in smaller lakes apparently existing at the same time. Thus we have it from the finely stratified deposits of a former mountain lake in Mink Creek Canyon, southern Idaho, and in horizontal strata of deltate deposits in the same locality where these rest directly, but unconformably, upon greenish Pliocene shales. It was found

similarly in mountain lake deposits. In Logan Canyon where these had been exposed by a cut made in the course of road construction to a depth of from sixty to a hundred feet below the upper surface and in similar deposits elsewhere. The species is present in the deltate deposits of Lake Bonneville, e.g., in the Salt Lake Valley, Malad Valley and Cache Valley. It is present in the deposits of the Salt Lake Valley itself in its more central area down to a depth of over seven hundred feet from the surface as shown by shells imbedded in cores of borings brought up from accurately determined levels in the course of drillings made by an oil company. This material, so far as separated, is in the Zoological Museum of the University of Utah. In the more superficial strata up to within a foot of the surface *S. kingi* occurs in large numbers, being commonly the most abundant form; while it is extremely common over the Sevier desert, lying on the surface over wide areas remote from the mountains and, therefore, never covered by detrital fill since the recession of the waters of Bonneville. It is similarly common in the deeper deposits of this region where these have been exposed in cuts made by the Sevier River.

In the facts available there seems to be nothing to support the suggestion made by Dall (1905) that the ribbing in *kingi,* whatever may be the case in other costate forms, is due to a progressive increase in the alkalinity of water due to evaporation and accordingly becomes more marked as we ascend the beds deposited in Pliocene and Pleistocene lakes. Speaking of the species under discussion Dall says: "It is to be borne in mind that the plications which led Meek to propose a genus for his species are pathological and not specific characters. They are directly due to the increase in the alkaline salts in the water inhabited by the mollusks and have been imposed upon various gastropods in the same situation." And again: "While such changes are the result of the direct action of the environment, and are not hereditary or evolutionary, it is, nevertheless, convenient to recognize the results in the systematic arrangement of the species."

The fact is that in the case of *S. kingi,* the largest percent-

age of strongly ribbed shells has been found in Pliocene specimens and those of probably very early Pleistocene age, such as those sifted out so abundantly on the shores of Bear Lake, the percentage of such shells decreasing in a general way, in line with Call's observations on other forms, such as *Pompholyx* (*Parapholyx*) in the Lahontan region, in more recent deposits, although conspicuously ribbed individuals are found among the living representatives of Utah Lake. The specimens from former mountain lakes show the characteristic ribbing in the usual varying degrees. Furthermore, this is also the case with specimens reared from eggs in aquaria, even where the shells are extremely thin and translucent from lack of appropriate mineral matter in the water. Such facts indicate that the ribbing is not "pathological" and due to the direct action of the environment, but that it is a truly genetic character, valid in specific definition. Upon this matter it is my expectation to present definite experimental evidence at another time.

DISTRIBUTION OF GASTROPODS IN THE MUDDY RIVER—SEPTEMBER, 1932

BY CHARLES H. BLAKE
Massachusetts Institute of Technology, Cambridge, Mass.

Casual captures of gastropods in the Muddy River (Boston, Mass.) over several years have indicated that some marked changes have occurred in the past year or two, so I have explored the whole length of it (about 3¾ miles) for a few conspicuous forms, of which I wish to put the distribution on record. In the following list the distances given are in miles from the mouth of the Muddy River, measured in midstream.

Viciparus contectoides. Six taken at .55 mi. (immediately north of Agassiz Road). Mr. W. J. Clench tells me this is a new introduction in the Muddy River.

Viviparus malleatus. From 1.4 to 3.0 mi., most abundant about 2 mi. up.

Lymnaea palustris. From 3.2 to 3.55 mi., formerly present at .55 mi.

Lymnaea auricularia. At 3.1 mi. (Leverett Pond), formerly at .8 mi. This is also wanting near the Boylston St. Bridge on the Charles River where it was first reported in this region.

Planorbis trivolvis. From .1 to 3.0 mi.

Physa heterostropha. From .1 to 3.55 mi.

Park attendants tell me that the Chinese take *V. malleatus* from the river by the sackful during the summer. Jamaica Pond at the head of the Muddy River is well populated with an introduced crayfish (*Cambarus immunis* var. *spinirostris*) and seems to have no gastropods near shore.

Due, undoubtedly, to the work on the new fills in the Charles River Basin, the Basin and the lower .4 miles of the Muddy River are very salt and support a brackish water fauna of crustaceans (*Cyathura carinata, Palaemonetes vulgaris,* and *Rhithropanopeus harrisi*). The chloride (as NaCl) at the mouth of the Muddy River is .311 to .321%; at .4 mi., .306%; at .9 mi., .216%.

Finally, I wish to thank Mr. Clench for assistance with the mollusks and Mr. C. M. Wareham (Chem. Dept., Massachusetts Institute of Technology) for help with the chloride determinations.

A SOUTH AFRICAN CONULINUS

BY HENRY A. PILSBRY

CONULINUS COCKERELLI, new species. Plate 6, fig. 7,

The Bluff, Durban, Natal. Type 158573 A. N. S. P., collected by Prof. T. D. A. Cockerell, 1931.

The shell is umbilicate, turbinate, thin, covered with a pale yellow periostracum (in the type, a "dead" shell, remaining only in shreds on the last whorl). Outlines of the spire slightly concave near the summit. Whorls moderately convex, with rather deeply impressed suture, the last whorl with evenly rounded periphery. Surface glossy, weakly

marked with fine, unequal wrinkles of growth, the apical whorl smooth. Aperture rather strongly oblique, rounded-trapezoidal, the lip thin, basal margin somewhat expanded, columellar margin dilated and reflected, half covering the umbilicus. Length 20.5 mm., diam. 16 mm., aperture 11.2 x 10.5 mm.; 6½ whorls.

This fragile shell is closely allied to *C. natalensis* (Krauss), but it differs conspicuously by its equably rounded instead of carinated periphery. In a fresh young specimen 5.5 mm. long, the periphery is nearly as sharply carinate as in *C. natalensis.* Neither specimen shows any trace of a band.

Thinking it improbable that a new species would be found at Durban I sent the type to Major M. Connolly, the first authority on South African shells, who writes as follows: "The *Conulinus* from Durban is not quite like any described species (as I have them all at hand for reference, in quantity, you may accept my word for it). The trouble is that it has no vestige of carination or I would assign it to *C. natalensis* (Krs.) without demur. It is narrower than *spadiceus,* higher than *mcbeanianus* and broader than *maritzburgensis,* with neither of which I would associate it, and no other species, such as *arenicola, carinifer, drakensburgensis,* etc. enters into the question."

It is a pleasure to name this shell for Professor Cockerell, in commemoration of his expedition through Africa in 1931.

NOTES AND NEWS

Dr. and Mrs. T. Wayland Vaughan left La Jolla August 28th for a seven months' trip around the world.

Mr. Joshua L. Baily, Jr., and Mrs. Baily have returned to La Jolla, California, after spending the summer in Philadelphia.

Mr. Horace F. Carpenter, the veteran Rhode Island conchologist, celebrated his nintieth birthday on October 19th at Edgewood, R. I., where he has lived for 52 years. An

informal reception and a family reunion were held. Mr. Carpenter's library and collection were presented some years ago to the city of Providence.

RELATIONSHIPS OF POLYGYRA PLATYSAYOIDES Brooks.—I have not seen this species, but it appears, from the description and figures, to be a toothless *Triodopsis*, most nearly related to *P. tridentata complanata*, of eastern Kentucky, and not related to *P. sayana*.—H. A. P.

LIMPETS BORED BY PREDACIOUS GASTROPODS?—This question answered decidedly in the negative by Wm. B. Marshall (NAUTILUS, 46, p. 45) has already been confirmed by Loppens (Ann. Soc. R. Zool. Belgique 57 (1926), p. 15); among the victims not of *Natica* but of *Purpura lapillus* he also names *Patella vulgata* L.

In the rich collection of the Hamburg Zoological Museum I have found two Patellid shells bored by predacious mollusks (according to the shape of the holes likewise by Purpurids): 1. *Patella* (*P.*) *ferruginea* with a hole measuring 2 mm.; 2. *Acmaea testudinalis* L. with even two borings, a begun and a finished one, each measuring 1⅓ mm.

It is therefore beyond all doubt that predacious gastropods do attack limpets to feed on them, in spite of the information given by naturalists that this is an "unsatisfactory food." The rareness of such observations is not surprising if we consider the difference of the biotopes.—DR. E. DEGNER, Hamburg, Zool. Museum.

[It should be noted that the observation of Purpurids eating limpets is not support for Dr. Beebe's observation on *Natica*, which belongs to a totally different ecologic association.—H. A. P.]

NATICA AND LIMPETS.—In regard to the discussion in the July and October numbers of the NAUTILUS about Dr. William Beebe's article "Snail Folk" which was published in *Nature Magazine* for April, in connection with his account of the boring of a Bermuda limpet by a *Natica*. A reference to Beebe's book, "Nonsuch, Land of Water," from which this

article was taken, shows on page 255 a list of text identifications which will definitely place the two "limpets" referred to in the text. The "low shelled limpet" is given as *Siphonaria brunnea* Hanl., and the "thin-shelled limpet," as *Fissurella barbadensis* Gmel. There is no illustration given, but definite acknowledgement is made that Chapter XIII, "Snail Folk" was published in *Nature Magazine.*

If a *Fissurella* is the shell to which he refers it is strange that such an apparently close observer as Dr. Beebe failed to note and to mention the fact that the shell was already pierced before the *Natica* arrived.—Morris E. Caruthers.

Further Comment on Limpets Bored by Natica.—I believe is is safe to say that the evidence against Dr. Beebe's observation of limpets bored by *Natica* is one hundred per cent. I have collected thousands of limpets in many parts of the world, and have seen fine large collections of them, and I never saw or heard of a limpet having been bored by a *Natica*. Also, I believe that *Natica* never bores *Siphonaria, Helcioniscus, Fissurella, Patella, Lepeta* and several other genera of the limpet form. I think it was unscientific for Mr. Beebe to have chosen the least likely victim of attack by *Natica* by picturing this species on top of a limpet. *Natica* confines its depredations mostly to bivalves, but often preys upon members of its own species as well as on other *gastropods*.—Walter J. Eyerdam.

Haplotrema vancouverensis chocolata Dall.—In my collection of State of Washington land shells are three specimens of *Haplotrema vancouverensis* Lea variety *chocolata* Dall. This seems to be quite a rare form; it is not listed in Junius Henderson's "Non Marine Mollusca of Oregon and Washington." Amongst perhaps 1,000 specimens of *H. vancouverensis,* these are the only examples of this variety that I have found. They were collected in April, 1923, near Coal Creek Canyon which is about 10 miles from Kelso, Washington. During two later trips to the same locality I did not find any. Typical *H. vancouverensis* is light greenish

yellow while variety *chocolata* is dark greenish yellow in the two juvenile specimens at hand and coffee brown in the single adult specimen. It can be recognized at a glance by its decided melanism. It is otherwise like *H. vancouverensis* in general characteristics and size.—WALTER J. EYERDAM.

A NOTE ON RYSSOTA (LAMARCKIELLA) OWENIANA Pfeiffer. —Mr. Maxwell Smith, in his paper on "New Philippine Land Shells," NAUTILUS, volume 46, page 62, describes *Rhysota lamarckiana globosa*. Looking up the disposition of this shell in my monograph on "The Larger Naninid Land Mollusks of the Philippine Islands," now going through press, I find that I have there bestowed the name *Ryssota* (*Lamarckiella*) *oweniana smithi* upon a specimen received from Mr. Maxwell Smith from the same locality from which his material came. The following key will help to differentiate the races of this species known at present:

Incremental lines of last whorl very rough on upper surface. *smithi*, new subsp.

Incremental lines of last whorl not very rough on upper surface.

Last whorl rather strongly malleated on last one-fourth of upper surface. . . . . *oweniana* Pfeiffer.

Last whorl not rather strongly malleated on last one-fourth of upper surface. . *inflatula* Möllendorff.

The type of *R.* (*L.*) *o. smithi*, new subspecies, is registered as Cat. No. 311021, U.S.N.M., and comes from Passi, Iloilo, Panay. It has 4.5 whorls, and measures: Altitude, 25.3 mm.; greater diameter, 43.0 mm.; lesser diameter, 33.5 mm. Typical *owcniana* Pfr. comes from the Island of Cebu, and *inflatula* hails from the Island of Negros.

Mr. Smith's subspecific name, unfortunately, is a homonym, having been used twice before, the first time in 1870 by Semper who described *Rhysota globosa* in volume 3, on page 75 and figured it on plate 2, figures 3 a-c, in his "Reisen im Archipel der Philippinen." This is now transferred to the genus *Hemiglypta*. It was used the second time in 1898 by von Möllendorff as *Rhysota sagittifera globosa*, Abhand-

lungen der Naturforschenden Gesellschaft zu Görlitz, volume 22, page 65.—PAUL BARTSCH.

A STATISTICAL TEST OF THE SPECIES CONCEPT IN LITTORINA, by John Colman, in Biological Bulletin for June, 1932, is an attempt to determine the specific status of the common small periwinkles of the north Atlantic. Lots of (usually) 100 collected in Norway, England and 8 New England localities were measured and compared, and the following conclusions reached:

"1. *Littorina obtusata* from Norway, from the Plymouth district in England, and from Rhode Island are so alike that they cannot be separated.

"2. *L. obtusata* from Rhode Island are fairly unlike those from Maine, but the examination of forms from intermediate localities establishes a continuous series up the New England coast. The range of variation remains roughly constant.

"3. Further confirmation of the unity of *L. obtusata* from this wide geographical range is found by adding together the data from all the 933 shells examined. Their proportions follow almost perfect monomodal frequency curves.

"4. The names *L. littoralis* (L.) and *L. palliata* (Say) must therefore go into synonymy under *L. obtusata* (L.), since it is shown that there is no division possible between forms to which these names have been given. The name *L. rudis* (Maton) must be put into synonymy under *L. saxatilis* (Olivi), as shown by Dautzenberg and Fischer (1912)."

VIVIPARUS CONTECTOIDES AT BUFFALO.—It long had been a matter of regret to the writer that such a pretty shell as *Viviparus contectoides* (W. G. Binney) had not been found near Buffalo when it was fairly abundant in other parts of the State. It was therefore with all the thrill of discovery that it was noted among a number of shells collected in September, 1931, by Harold R. Robertson from Lake Erie at the foot of Michigan Avenue in Buffalo. Mr. Robertson visited the same locality again the past summer and found many more specimens some of which contained the animal.—IMOGENE C. ROBERTSON.

ACELLA HALDEMANI ("Desh." Binney).—This peculiar snail has been studied by J. P. E. Morrison in lakes in Vilas Co., northeastern Wisconsin (Trans. Wisc. Acad. Sci., Arts and Letters, vol. 27, pp. 397-413). He finds that "the snail *Acella* has a life-span of only one year. The eggs are laid in the spring, a month or so after the ice leaves the lakes. The juvenile individuals hatch and grow to full size by early fall. They over-winter as adults, lay eggs the following spring and die by midsummer.

"*Acella* does not migrate to deep water, but remains in the zone of vegetation near shore at all times of the year. When the vegetation has been killed by winter conditions, the snags and logs serve as a substitute habitat on which to live and lay eggs.

"The shell of this species shows variation directly produced by the habitat. The individuals living on the rushes (*Scirpus*) have narrower apertures with almost parallel margins, while those from other plants show greater convexity of the whorls and wider apertures with more evenly arched outer lips."

LAMPSILIS AT OLD NEW MEXICAN CAMP SITES.—The University of Colorado Museum recently received from Dr. H. P. Mera several shells of *Lampsilis ventricosus* (Barnes)—*L. cardium* Raf., according to Frierson's checklist—from ancient Indian camp sites "east of the Pecos," New Mexico. This is out of the range of *Lampsilis*, and the shells almost certainly were brought by the Indians from east of the divide between Pecos and Mississippi drainage.—JUNIUS HENDERSON.

ARION CIRCUMSCRIPTUS IN MASSACHUSETTS.—*A. circumscriptus* of the color variety *leucophaea* s. str. was found Sept. 16, 1932, at Natick, Mass., in a situation agreeing ecologically with Taylor's description. Seven specimens were taken. The radular formula is 31-1-31. The reproductive system is normal in the dissected example except for the relatively great size of the ovariotestis. This species is new to New England.—CHARLES H. BLAKE.

TOM SHAW OLDROYD

We are sorry to record the death on November 3rd of the well known Californian conchologist T. S. Oldroyd. Mr. Oldroyd was born in Huddisfield, England, June 13, 1853, his parents removing to this country two years later, settling at Flushing, Long Island. He went to California in 1880, living at Los Angeles and Long Beach. In 1895 he married Miss Ida Shepard. It was a congenial union of two shell lovers. Together they collected in California, Washington and elsewhere, and in 1929 made a trip around the world. In 1916 he became connected with the Geological Department of Stanford University, the Oldroyds becoming curators of the collection of recent mollusks, containing part of the Henry Hemphill collection, and which was greatly augmented by the gift of their own large collections.

Mr. Oldroyd was especially attracted to minute shells, which he collected with great success. He published the following articles on mollusks:

Collecting shells from the Haliotis.

A summer's collecting at Friday Harbor, Washington.

New Pleistocene mollusks from California.

Some western varieties of Olivella.

The Fossils of the Lower San Pedro Fauna of the Nob Hill Cut, San Pedro, California. An unpublished paper on Dead Man's Island, San Pedro.

Mr. Oldroyd is survived by his wife, who has the deep sympathy of many warm friends among conchologists both here and abroad.

WE ARE GRIEVED to record the death December 17 of Dr. Charles Torrey Simpson at his home in Lemon City, Florida.

TOM SHAW OLDROYD
[with Mrs. Oldroyd]

MAP OF THE
CRUISE OF THE "PETREL"

THE NAUTILUS.

Vol. XLVI APRIL, 1933. No. 4

THE CRUISE OF THE PETREL

BY HERBERT N. LOWE

(Continued from page 76)

Our next anchorage was off the lagoon on the south end of San José Island, the home of the pearl fishers. On the flats across from the lagoon channel we noticed a canoe with three natives busily gathering something edible. These proved to be *Strombus granulatus* Gray which were spawning here by the hundred. The fishermen preferred them to any bivalves, and carried away several sacks full. We tried them for dinner that evening and found them quite palatable.

On the sand bars at the mouth of the estuary where the current ran swiftest, I took a fine lot of *Cardium biangulatum* Sby. and two species of *Glycimeris*. On another bar were many fine *Cardium consors* Sby. and *Arca multicostata* Sby. At our anchorage on the north end of San José Island I took my first pairs of *Glycimeris gigantea* Rve. and *Crassatellites undata* Sby., also two more fine *Pitar pollicaris* Cpr. and some excellent pairs of *Venus subimbricata* Sby. This species, while not uncommon as odd valves, is exceedingly rare in perfect pairs.

Next day we made a stormy run to San Diego Island and then to Santa Cruz Island where we anchored for the night. A few hours north of here we came to the lovely island of Santa Catalina where I had excellent luck in collecting *Bulimulus johnsoni* Hanna, living under rock slides on the north side of the main canyon. A few *Bulimulus slevini* Hanna were taken on Monserrate Island and *Bulimulus santacruzensis* Hanna on Santa Cruz Island. On Danzante Island and at Puerto Escondido just opposite on the peninsula I

took some living specimens of *Bulimulus lamellifer* Pils.; *Coelocentrum insulare* Hanna I took on Danzante Island and *Coelocentrum vanduzeei* Hanna at Puerto Escondido in company with the rare and interesting *Berendtia taylori* (Pfr.)

The mountains a few miles back from Puerto Escondido towered precipitously some five thousand feet in a most spectacular manner. Especially under the early morning or late afternoon light the wonderful stratification was very clear in all its colors, much like the Grand Canyon of Arizona.

Continuing north we reached Carmen Island, where under rock slides another Bulimulus was taken, *B. ximenez* Hanna. In a haul with the tangle in fifteen fathoms in Salinas Bay we took our first living *Spondylus pictorum* in company with *Arca pacifica* Sby. and *Ostrea megodon* Hanley, all wonderfully fine specimens.

At low tide I took my first living *Heliacus variegatum* Lam. feeding among a short olive-green ascidian which covered the rocks in places. The spirally elevated operculum of this species is exceedingly interesting. In company with them were a few *Cuma costata* Blv. On Coronado or San Ildefonso Island we took no land shells but on Tortuga I collected *Bulimulus dentifer* Mabille under blocks of black lava not far from the crater's rim.

From here we had a pleasant eight hour run across to Guaymas where we arrived December 22, in time for the port officials to enter us before five P. M. The following day while the yacht was being refueled, watered, and provisioned we tried our luck on the low tide at "Miramar" on the outer coast. Here we took *Arca illota* Sby., *Fusinus cinereus* Rve., *Crassispira nymphaca* Pilsbry and Lowe under rocks, and on the mossy surface of some large boulders were *Trivia solandri* Gray feeding on sea lettuce.

The following morning we had our clearance papers and went up the coast as far as San Carlos Bay where we worked the afternoon tides with tolerable results. One live *Lyria cumingii* Brod., *Conus regularis* Sby., *Murex bicolor* Val., *Murex radix* Lam., *Turritella goniostoma* Val., *Polynices,* and olivas were in the catch.

Christmas day was spent in a small cove opposite San Pedro Nolasco Island, and early the next morning we started on our long run to Tiburon Island. We arrived after a cold, windy day at seven P. M. at Pelican Island just off Kino Bay. At the time of our visit the miserable remnants of the two tribes of Seri Indians which had inhabited Tiburon Island from earliest history where on the mainland opposite, fishing for Tortuava.

The chief, Chico Romero, and his family came out to look us over and beg for something to eat. We satisfied them with bread, cookies, oranges, cigarettes, and a can of coffee. Later in the day we moved over to the anchorage just off the hunting lodge and went ashore for the afternoon tide. The sand beach well rewarded us with many uncommon species of bivalves in pairs at the high tide line. *Cancellaria cassidiformis* Sby. and *Crassispira bottae* Val. were among the rare gasteropods taken.

On a small mud bar in the estuary I found a fine large species of *Lithophagus* which I had never seen before. A notable feature of the mollusk fauna of the Gulf region is the number of species which are the largest of their genus. I have measured the following species from my collection which will give some idea of their huge size. Needless to say there are many others a fraction of an inch larger.

Metis alta Conr.	3 5/16 inches
Dosinia ponderosa Gray	4 7/8 inches
Glycimeris gigantea Sby.	3 1/4 inches
Cardium elatum Sby.	5 1/2 inches
Chione gnidia Brod. & Sby.	3 7/8 inches
Arca grandis Sby.	5 5/8 inches
Dolium ringens Swns.	8 inches
Patella mexicana Brod. & Sby.	8 1/2 inches
Melongena patula Brod.	7 1/2 inches

Our huge Pinna, Spondylus, Murex and Fasciolaria run a close second place. Altogether this region has more species of huge size than any other part of the world of equal area. The close similarity between many of the Gulf of California

and Gulf of Mexico species has been noted many times by previous writers. A number of species seemingly impossible to distinguish from those of the South sea fauna also crop up in our molluscan lists from the Mexican West Coast.

Most prominent is *Coraliophila madreporarum* Sby. which I have taken from the Tres Marias Island and south to San Juan del Sur, Nicaragua. I have also taken *Cypraea isabella mexicana* Stearns from Tres Marias. I have two badly worn but unmistakable specimens of *Voluta ancilla* Sby. and *Voluta deshayesi* Rve. from Clipperton Island. On this present trip I found on San José Island a good beach specimen of the rare *Cassis vibex mexicana* Stearns, only reported twice previously.

Cypraea caput-serpentis L. is reported by the St. George Expedition as being dredged off Coiba Island, Panama. Stearns reports *Thais hippocastaneum* and *Murex palmarosae mexicana* Stearns from the Gulf and there are many other records of South sea species, or local forms of them, in the literature from this province.

The next five days were spent on Tiburon Island with rather poor results as the tides were not so good. At our anchorage in Fresh-water Bay on the north coast of the island the first specimens of the beautiful and fragile *Acmaea dalliana* Pils. made their appearance. This species seems to be restricted to the upper part of the Gulf only. We did not find it on the south coast of Tiburon Island. With them were the largest and finest colored *Acanthochitona exquisita* Pils. taken on the entire trip.

At Tepoca Bay on the mainland across from the north end of Tiburon Island we found another small tribe of Seri who visited us the following day. I literally traded the shirt off my back for a couple of their baskets, and one squaw wore it much to the envy of her sisters. They live in miserable brush hogans which give little protection from the cold winds.

After an all night run across the Gulf we reached Animas Bay on the peninsula. Even with a very low tide we found this a poor place for molluscs but very rich in three species of large sand dollars and the immense twenty-rayed star fish

which were feeding on *Crucibulum spinosum* Sby. The two tides spent at Angeles Bay were not much better as far as molluscs were concerned. At the head of the bay are miles of forest of the giant cactus. On many of the islands also are marvelous specimens of these giant forms.

The north end of Angel de la Gardia Island, our next stop, seems to be the type locality of *Acmaea dalliana* Pils. We took some fine ones here along with many Chitons and a large colony of *Cypraea annettae* Dall. At the south end of the same island a large school of *Pecten excavatus* Anton had been thrown up by a southeast gale on the boulder strewn beach. I have never taken this or *Pecten subnodosus* Sby. alive except with the dredge or tangle.

A little way south we stopped at Raza, a small but most interesting island, as it has been the breeding grounds of the Heerman Gull for untold generations and has for many years been the resort of the egg gatherers and guano hunters from Guaymas. The stones have been cleared from the ground and piled in long walls to give the birds better nesting places and render the guano more accessible. From the water these walls look much like the ruins of some prehistoric civilization. A day each was spent on San Lorenzo and San Esteban Islands.

At the latter island, where we lay at anchor sheltered from the northwest wind, without any warning a fresh current from the opposite direction took the yacht almost aground on the rocks, and but for prompt action of all on board serious damage might have resulted. As it was we bumped two rocks. The tides have a tremendous rise and fall in this part of the Gulf and strong currents run around the islands which with the prevailing swell and the heavy and sudden winds make the Gulf at times a very treacherous body of water. At the north end of Angel de la Guardia we came in at high tide over a place which a few hours later showed a black ugly reef. The upper part of the Gulf is one of the most desolate and lonely spots in the world. The islands are waterless and uninhabited, and the coast line of both sides is practically so. We passed but one boat of any de-

scription in all the three weeks we were there. San Pedro Martir, a small rock mass lying in lonely isolation in the middle of the Gulf was our next stop.

Its sheer black walls rose perpendicular over a thousand feet to its flat summit crowned with a forest of giant cactus. Every ledge in the sheer cliff was white with guano from the thousands of sea birds which breed here every year. At only one spot on the island is it possible to land and that only in calm weather. Thousands of sea lions came out to greet us and barked a noisy welcome.

We made Guaymas early the next morning where we took on oil, water and provisions for the return voyage. Clearing at noon the day after, we spent the afternoon in dredging in fifteen to twenty fathoms outside the bay with passable results.

That night we crossed the Gulf and lay at anchor two days in the lee of San Marcos Island; as the northwest winds were still strong. A few Bulimulus were collected here but the live shells were very scarce. After a rough three-hour run we anchored in Coyote Cove on the west side of Concepcion Bay. Here we passed two of the most perfect days on our whole trip; not a breath of air stirred, and the water was so clear that objects at a three foot depth were plainly visible.

The number of species in the tidal zone of Concepcion Bay was not very great, but the forms were very abundant. At no other place on either side of the Gulf did we take *Arca pacifica* Sby. living between tides, but here they were very large and abundant; most of them, however, were very badly covered with foreign growth. The natives gather them for food as well as the large *Strombus galeatus*. The *Murex bicolor* Val. were much in evidence feeding on *Macrocallista squalida* Sby. Sometimes as many as fourteen would be gathered around awaiting the demise of a single unfortunate clam. They don't drill the shells like the Naticas but merely envelope the clam with their foot until it succumbs from suffocation or starvation; when the whole hungry herd proceeds to the feast.

Some good living *Dosinia ponderosa* Gray and *Glycimeris*

gigantea Rve. were taken on the sand flats along with quantities of Chiones.

A second stop was made at the lower end of the bay opposite the large lagoon. Plowing around in the soft mud were a goodly number of *Lyria* (*Enaeta*) *cumingii* Brod. the first I had taken alive except an occasional specimen. They seem to prefer sandy mud at or below extreme low water. Heretofore I had taken single living specimens at La Paz, Tiburon Island, and San Carlos Bay, and hermit crab specimens at several other localities.

At Concepcion Bay I took a large *Chama* which I did not find living at any other station; most of the huge specimens were simply riddled with worm holes making them almost unfit as specimens. Unlike most Chamas they were but slightly attached.

A second landing was made on Carmen Island and Ensenada de los Muertos and then a straight run to the Revilla gigedo Islands. Our first anchorage was on the south side of Socorro Island where some good Chitons and *Acmaea* were taken, also *Thais planispira* Lam. and the largest *Turbo fluctuosus* Wood I have ever seen were here in abundance. I had never taken but two live *Thais planispira* Lam. previously in four years; so I was delighted with thirty good examples.

Socorro, while not given over greatly to cactus, is so densely covered with brush as high as a man's head that traveling is very slow. The dense brush made the wool crop so unproductive that the sheep company had to give up their island holdings.

After a brief stop at San Benedicto Island we set our course northward for the San Benitos Islands where we anchored after a long four days' trip out of sight of land all the way. I put in my time here collecting *Micarionta pandorae* Fbs. under rocks and agaves and was rewarded with a wonderful color series.

From here we made a straight run for Ensenada and home to San Pedro after just ten weeks on the water.

MARINE AND FRESHWATER MOLLUSKS NEW TO THE FAUNA OF CUBA

BY H. A. PILSBRY AND C. G. AGUAYO

The present paper is based mainly on a collection of Cuban marine mollusks brought by the junior author to the Academy of Natural Sciences of Philadelphia to be identified. Most of the shells were collected by Dr. Pedro J. Bermudez, Miguel Jaume and C. G. Aguayo, but in addition, species from other sources are also included.

Among the bulk of common forms here listed for a better knowledge of their geographic distribution, six new species described in this paper and others not before reported or little known from Cuba, were found.

HAMINOEA ELEGANS (Gray). *Bulla elegans* Gray, 1825, Ann. of Philos., New Ser., 9, p. 408.

La Chorrera, Habana. A single specimen, coll. by C. G. Aguayo.

ACTEOCINA BULLATA (Kiener). *Tornatella bullata* Kiener, Sp. et Icon. Coq. Viv., p. 5, pl. 1, fig. 4.

La Chorrera, Habana. One specimen, collected by C. G. Aguayo.

HEBETANCYLUS CUBENSIS, sp. nov. Plate 6, figs. 1, 1*a*, 1*b*.

Charco Mercedes, Holguin, Oriente. Type No. 160202, A.N.S.P., José A. Garcia Castaneda, coll.

Shell oblong, brittle, glassy, translucent, of ivory yellow color. Sculpture formed by fine radiating riblets and minute concentric striae. The axial riblets do not reach the apex, which is densely and finely pitted; the punctation irregular, not disposed radially. Anterior slope and left side convex, posterior declivity concave, right side straight. Apex posterior, curved to the right and slightly bent downward. Apical depression round, small and situated at the vertex.

Length 7 mm., diam. 5 mm., alt. 2 mm. Paratype.

Length 7.2 mm., diam. 4.6 mm., alt. 2 mm. Holotype.

Paratypes in the collection of C. G. Aguayo. Differs from *H. adelinus* Bourg., to which it seems to be very closely related, by its larger size, the concavity of its posterior end (straight in *adelinus*), and by having the apex more curved;

the shell being narrower and less elevated, the proportions of height varies from 20 to 30 per cent, while in *adelinus* it varies from 34 to 50 per cent.

In the proportions this species is similar to *Ferrissia* (*Laevapex*) *pallida* Poey, from which it differs by having conspicuous concentric striation (obsolete or none in *pallida*). Poey did not describe the apical sculpture of his species, but some specimens collected in Havana by Arango, which agree with his description by lacking the concentric striation, have the apex smooth.

TEREBRA LIMATULA ACRIOR Dall. *Terebra limatula* var. *acrior* Dall, 1899, Bull. Mus. Comp. Zool., vol. 18, p. 66.

La Chorrera, Habana. Several specimens collected by C. G. Aguayo.

DRILLIA EBUR Reeve. *Pleurotoma ebur* Reeve, 1845, Conch. Icon., 1, *Pleurotoma*, pl. 11, fig. 275.

La Chorrera, Habana. One specimen collected by Miguel Jaume.

MARGINELLA DENTICULATA Conrad. *Marginella denticulata* Conrad, 1830, Journ. Acad. Nat. Sci. Philad., 6, p. 225.

La Chorrera, Habana, C. G. Aguayo; Varadero, Matanzas, P. J. Bermudez.

MELANELLA ACUTA (Sowerby). *Eulima acuta* Sowerby, 1834, Pr. Zool. Soc. Lond., p. 8.

La Chorrera, Habana. One specimen collected by C. G. Aguayo.

MELANELLA HYPSELA (Verrill and Bush). *Eulima hypsela* Verrill and Bush, 1900, Trans. Conn. Acad. Art. Sci., 10, p. 526, pl. 64, fig. 9.

Varadero, Matanzas. A single specimen collected by P. J. Bermudez.

MELANELLA BERMUDEZI, sp. nov. Plate 6, fig. 3.

Varadero, Matanzas, a single specimen. P. J. Bermudez collection, 1932. Type 160204 A.N.S.P.

Shell white, smooth, transparent, showing the columellar

axis in all the whorls; very elongated, wholly arcuated, the apical third much more so. Whorls 12, very slightly convex. Suture linear, oblique. An infrasutural line is visible on each whorl at about ¼ the length of the whorl. Growth rest grooves arcuate, in a vertical series on the concave side of the shell. Both suture and infrasutural lines descend to each growth rest, ascending after it, forming an acute angle. Last whorl very long. Aperture lanceolate, acute superiorly; columellar margin broadly concave, external lip almost straight, convex in profile. Length 4.3 mm., diam. 0.9 mm., aperture 1 mm. long.

This graceful little shell is easily recognizable by its glassy transparence, its arcuate shape and its elongate last whorl and aperture.

PYRAMIDELLA NIVEA (Moerch). *Obeliscus niveus* Moerch, 1875, Malak. Bl., 22, p. 159.

Varadero, Matanzas, collected by P. J. Bermudez; La Chorrera, Habana, C. G. Aguayo collector.

ODOSTOMIA BABYLONIA C. B. Adams. *Odostomia babylonia* C. B. Adams, 1845, Pr. Bost. Soc. Nat. Hist., 2, p. 6.

La Chorrera, Habana, one specimen collected by C. G. Aguayo; La Habana, one specimen collected by A. A. Olsson.

ODOSTOMIA (MIRALDA) HAVANENSIS, sp. nov. Plate 6, fig. 4.

La Chorrera, Habana, one specimen collected by C. G. Aguayo. Holotype, Ac. Nat. Sci. Philad., No. 159722. La Habana, two specimens collected by A. A. Olsson. Paratypes.

The shell is lengthened ovate conic, white. Nuclear whorl smooth, large and bulbous, with the tip depressed. Subsequent whorls of the spire bicarinate, the keels obtuse, strongly tubercular, and separated by a deep concavity. On the last whorl the second tubercular keel forms the periphery, and there are three strong, cord-like smooth keels on the base, the lower one smallest. The aperture is ovate; no columellar fold visible.

Length 1.95 mm., diam. 0.9 mm., aperture 0.6 mm. long.; diam. of nucleus 0.2 mm. 4½ postnuclear whorls. Type.

Length 2 mm., diam. 0.95 mm. Topotypes.

CERITHIUM ATRATUM Born. *Cerithium atratum* Born., 1780, Mus. Caes. Vind., p. 324, pl. 11, figs. 17, 18.

La Chorrera, Habana, M. Jaume collector; Punta de Sabanilla, Matanzas, E. Portuondo, collector.

CERITHIOPSIS GREENII (C. B. Adams). *Cerithium greenii* C. B. Adams, 1839, Bost. Journ. Nat. Hist., 2, p. 287.
La Chorrera, Habana, .C G. Aguayo collector.

TRIPHORA HEBES Watson. *Cerithium hebes* Watson, 1881, Journ. Linn. Soc., 15, p. 103.
La Chorrera, Habana, C. G. Aguayo. A single young specimen.

TRIPHORA NIGROCINCTA (C. B. Adams). *Cerithium nigrocinctum* C. B. Adams, 1839, Bost. Journ. Nat. Hist., 2, p. 286, pl. 4, fig. 11.
La Habana. Coll. Acad. Nat. Sci. Phila.

TRIPHORA SOMERSI Dall and Bartsch.
Varadero, Matanzas, P. J. Bermudez collector. Four specimens.

BIVONIA DECUSSATA (Lamarck). *Serpula decussata* Lamarck, 1818, Anim. sans Vert., 5, p. 363.
La Chorrera, Habana, C. G. Aguayo collector.

LITTORINA MINIMA (Wood). *Turbo minimus* Wood, 1828, Suppl. Index Test., p. 19, pl. 6, fig. 29 n.
La Punta, Habana, H. N. Lowe. Five specimens.

RISSOINA BROWNIANA LAEVISSIMA (C. B. Adams). *Rissoa laevissima* C. B. Adams, 1850, Contr. to Conch., p. 115.
Varadero, Matanzas, P. J. Bermudez collector; La Chorrera, Habana, C. G. Aguayo collector.
Adams' type lot, as well as a series from Varadero, show intergradation of characters between *R. browniana* Orb. and *R. sloaneana* Orb. The number of whorls varies from 7 to 8 (5-6 in *sloaneana* and 8-9 in typical *browniana*) ; the apex is similar to that of *browniana* but the apertures of most of the specimens have the internal teeth characteristic of *sloaneana*. Perhaps the last species is only an extremely short variety of *browniana*.

RISSOINA KREBSI Moerch. *Rissoa krebsi* Moerch, 1876, Malak. Bl., p. 50.
La Habana, Olsson collector.

HYDROBIA TORREI, sp. nov. Plate 6, fig. 2.

Quinta de los Molinos, Habana. One specimen, No. 160199 A.N.S.P., collected by C. G. Aguayo.

Shell very narrowly umbilicated, conic, of horn color, with three pale brown bands on the last whorl, the upper band very faint. Sculpture of minute growth lines and faint microscopic spiral striae, visible only under high magnification. Last whorl large, convex. Aperture ovate, angular above, otherwise rounded; outer lip simple, columellar lip expanded, forming a subtriangular callus at the parietal wall.

Length 3.5 mm., diam. 2.5 mm.; aperture 1.75 mm. long.

This shell is remarkable for the presence of colored bands on the last whorl, a condition common in the Viviparidae, but very unusual in Amnicolidae. There is no other shell of the genus with which it can be confused.

TEGULA (OMPHALIUS) HOTESSERIANA (Orb.).

Trochus hotesserianus Orb., 1842, Sagra, Hist. Cuba, Mollusques, 2, p. 59.

Trochus maculostriatus C. B. Adams, 1845, Pr. Bost. Soc. Nat. Hist., 5, p. 59.

La Chorrera, Habana, M. Jaume collector.

Although the synonymy of the two names has been recognized for a long time, the priority has often been given to Adams' species, inverting the true order of publication.

TEGULA (OMPHALIUS) SUBSTRIATA (Pilsbry). *Chlorostoma substriatum* Pilsbry, 1889, Man. of Conch., 11, p. 187, pl. 29, fig. 78.

La Chorrera, Habana, M. Jaume, collector.

HAPLOCOCHLIAS SWIFTI Vanatta. *Haplocochlias swifti* Vanatta, 1913, Pr. Acad. Nat. Sci. Phila., p. 23, fig. 3.

La Chorrera, Habana, one specimen collected by C. G. Aguayo.

CIRCULUS CUBANUS, sp. nov. Plate 6, figs. 6, 6*a*, 6*b*.

Varadero, Mantanzas, P. J. Bermudez collector. One specimen, the holotype, No. 160198 A.N.S.P.

Shell small, vitreous, flattened, widely umbilicated. Whorls 4. Nucleus small, smooth. Spire depressed. Suture distinct.

Last whorl with six spiral threads: three strong keels on the periphery, in profile situated in an oblique straight line, the lowest keel being the outer; above the peripheric keels, midway between the upper one and the suture, there is a spiral cord; below the keels, on the basal area, there are two cords, one around the umbilical area, the other midway between it and the lower peripheric keel. There is also a faint, microscopic spiral striation between the keels. Aperture rounded; outer lip thick, externally modified by the spiral threads; columellar lip slightly callous.

Height 1 mm., diam 0.45 mm.

This shell is very remarkable by the position of its six spiral ribs of the last whorl, and mainly by having three strong peripheric keels in the same straight line in profile view.

FISSURELLA ROSEA (Gmelin). *Patella rosea* Gmelin, 1792, Syst. Nat. Edit. 13, p. 3730.

Varadero, Matanzas, C. G. Aguayo collector.

DIADORA ALTERNATA (Say). *Fissurella alternata* Say, 1822, Journ. Acad. Nat. Sci. Philad., 2, p. 281.

Playa de Guanimar, Habana, J. Aguayo collector.

DIADORA VIRIDULA (Lamarck). *Fissurella viridula* Lamarck, 1822, An. sans Vert., 6, p. 13.

La Chorrera, Habana, C. G. Aguayo collector.

This species was not mentioned by Arango in his "Fauna Malac. Cubana" though it was reported from Cuba by Pfeiffer in 1840, Wiegm. Arch. f. Naturg.

COECUM BRASILICUM de Folin. *Coecum brasilicum* de Folin, 1875, Les Fonds de la Mer, 2, p. 212, pl. 9, fig. 6.

Peninsula de Hicacos, Matanzas, and Punta Alegre, Camaguey, H. A. Pilsbry collector.

COECUM COOPERI Smith. *Coecum cooperi* Smith, 1862, Ann. N. Y. Lyceum, 7, p. 154.

Varadero, Matanzas, P. J. Bermudez collector.

COECUM FLORIDANUM Stimpson. *Coecum floridanum* Stimpson, 1851, Pr. Bost. Soc. Nat. Hist., 4, p. 112. *Coecum dux* de Folin, Les Fonds de la Mer, 1, p. 264, pl. 24, figs. 4-5.

Punta Alegre, Camaguey, H. A. Pilsbry collector; Varadero, Matanzas, P. J. Bermudez collector.

CAECUM CAROLINIANUM Dall. *Caecum carolinianum* Dall, 1892, Trans. Free Wagner Inst., Philad., 3 (2), p. 300, pl. 22, fig. 25.

Punta Alegre, Camaguey, H. A. Pilsbry collector; Habana, A. A. Olsson collector.

CAECUM FORMOSULUM de Folin. *Coecum formosulum* de Folin, 1868 (?), Les Fonds de la Mer, 1, p. 124, pl. 11, figs. 9, 10.

Punta Alegre, Camaguey, H. A. Pilsbry collector.

CAECUM GLABRUM (Mont.). *Dentalium glabrum* "Mont." J. Fleming, 1813, Brewster's Edinb. Encycl., 7, p. 67.

MEIOCERAS NITIDUM (Stimpson).

Coecum nitidum Stimpson, 1851, Pr. Bost. Nat. Hist., 4, p. 112.

Meioceras leoni Berillon, 1875, in de Folin and Perrier, Les Fonds de la Mer, 2, p. 251, pl. 10, fig. 3.

Batabano, Habana, C. F. Baker collector; Rio Cauto, Oriente, L. Aman collector; Punta Alegre, Camaguey, H. A. Pilsbry collector; Peninsula de Hicacos, Matanzas, H. A. Pilsbry collector; Varadero, Matanzas, P. J. Bermudez collector.

MEIOCERAS CONSTRICTUM, sp. nov. Plate 6, fig. 5.

Varadero, Matanzas, P. J. Bermudez collector, five specimens. Holotype No. 160200 A.N.S.P. Paratypes in collection of C. G. Aguayo.

Shell arcuate, subcylindrical, contracted at both ends, the anterior one being broader. Middle part weakly contracted; external side somewhat saddle-shape. The broadest part near the anterior end, at about ⅓ of the length of the shell. Aperture circular, very oblique, facing the concave side. Surface white, smooth, shining, with minute growth lines. Septum projecting in a point near the convex side, sloping to the concave side.

Length 1.9 mm., greatest diam. 0.5 mm.

This species is very near *M. nitidum* (Stimpson) in size, color and sculpture, differing mainly by having a saddle-shaped contraction at the middle of the length, and the larg-

est diameter at the anterior third, while in *nitidum* the shell is swollen at the middle, where the largest diameter is located.

CALLISTOCHITON SHUTTLEWORTHIANUS Pilsbry. *Callistochiton shuttleworthianus* Pilsbry, 1892, Man. of Conch., 14, p. 23, pl. 21, figs. 42-45.

Varadero, Matanzas, P. J. Bermudez collector; a single anterior valve.

ARCA (BARBATIA) CHEMNITZI Philippi. *Arca chemnitzi* Philippi, 1851, Zeitschr. f. Malak., 8, p. 50.

Gibara, Oriente, A. Gaston collector.

CRASSINELLA LUNULATA PARVA C. B. Adams.

Varadero, Matanzas, P. J. Bermudez collector.

FIELD NOTES ON CHITONS OF CRESCENT CITY, CALIFORNIA

BY E. P. AND E. M. CHACE

Having occasion to spend some time at Crescent City, California, the writers have taken advantage of the opportunity to do some intensive collecting in the tide pools of the rocky reefs which fringe this coast. To date we have taken over 90 species of mollusks (including 7 nudibranchs) and the chitons have been a prominent part of the local fauna. Perhaps the field notes presented here will be of interest to students who are unable to visit these waters.

Cryptochiton stelleri (Midd.). This active fellow is not uncommon in the lower tide pools. In August and September the smallest specimens seen were four to five inches long. On the December and January tides we found several smaller specimens, the smallest being three-fourths of an inch long. These were on rocks at the outer edge of the tide pools and usually a foot above the lowest tide level. Adult specimens were seldom seen out of water even at the lowest tides.

Lepidochitona lineata (Wood). Common and somewhat variable in color.

Lepidochitona raymondi Pils. The smallest of the common chitons here.

Ischnochiton mertensii (Midd.). Common and handsome.

Ischnochiton cooperi Cpr. Not previously reported north of Mendocino County, but common here.

Ischnochiton regularis Cpr. Has not been reported from north of Mendocino County but not rare here. Quite variable in color. Imagine one of a solid turquoise blue!

Mopalia lignosa (Gld.). Large and abundant.

Mopalia muscosa (Gld.). Smaller and less common than further south.

Mopalia hindsii (Rve.). Some very large ones.

Mopalia ciliata (Sby.). Not very common, quite variable in color.

Placiphorella velata Cpr. Not uncommon here. Although the girdles are dark in all our dried specimens they vary considerably in color when alive, being white, greenish-white, rose, or white mottled with rose. Like most of the members of this family, this species lives anywhere, and is evidently inactive, being frequently decorated (or burdened) with a large clump of algae, and leaving a distinct mark when removed from its position on the rock.

Basiliochiton heathii (Pils.). Previously reported from Monterey only, though some of the records of *Trachydermon flectens* Cpr. should perhaps be referred to this species. Our specimens range up to 27 mm. in length and from dull green to brilliant red in color. Two valves are frequently very dark brown and while noticeable on the green they give a really bizarre effect on the red specimens.

Lepidopleurus sp.? Several specimens of this group have been taken but no attempt has been made to refer them to any particular species.

A BIOLOGICAL COLLECTING EXCURSION TO THE ALEUTIAN ISLANDS

BY WALTER J. EYERDAM

For several years I have been engaged as a free lance collector in making biological collections in Alaska and Siberia.

Since 1918 I have made five trips to Siberia, including two to Kamchatka and eleven trips to Alaska. Most of the work has been taken up in botanical collecting for the Riksmuseum of Stockholm during the years of 1928 in Kamchatka and 1931 and 1932 in Alaska. On all of these excursions large collections of shells have been made with the result that many new species have been discovered and more than 60 species were taken from beyond the known limits of Dall's Bulletin 112 (1921).

On April 18th, 1932, in company with Dr. Eric Hulten, botanist from the Riksmuseum, Stockholm, I sailed from Seattle to Unalaska on the coast guard cutter "Tahoe". One of our stops was at Kodiak where we arrived on April 27th. It was raining and blowing sleet nearly all day but we went ashore with some of the officers and made good use of our time by collecting mosses and shells. On Woody Island which is across the bay from Kodiak village I picked up over a dozen large and perfect specimens of *Serripes groenlandicus*. They seem to be numerous in that locality for on four previous visits to Kodiak and Afognak Islands I found but a few. In a small lake on Woody Island I also found the broken shells of thousands of *Anodonta beringiana* Lea. This was the work of introduced muskrats. Only ten perfect shells were found, although in the deeper water they were probably numerous. This is the first time it has been my good fortune to find this species in Alaska, although it is known to be common in some other lakes on the mainland.

We arrived at Unalaska on May 1st but as this was nearly two months too early for collecting flowers we found plenty of other kinds of collecting profitable to take up our time. Large series of marine algae, lichens and mosses were made and also a good series of the local avifauna were prepared. Ten days of strenuous digging in the middens of an Aleut Stone Age village on Amoknak Island near Dutch Harbor revealed many interesting objects including over 200 artifacts, human skulls and a large variety of animal remains. An account of this digging and a list of the animals, includ-

ing the shells of 34 species of mollusks will appear in "The Murrelet".

Dredgings in Illuliuk Bay near Dutch Harbor brought up a fine specimen of *Beringius crebricostatus undatus* Dall, a rare shell. Several good examples of *Pyrulofusus harpa* Mörch were also brought to light. On the reef between Dutch Harbor and Unalaska I found the exact spot where B. Randolph discovered *Melanella randolphi* Vanatta in 1898. His paratypes are mostly in my collection. On bread sponges under rocks at low tide I collected over 500 of this pretty little parasite. Altho it is reported from as far south as Puget Sound I have not found it in any other spot but at the exact type locality. Many interesting small shells were taken in the vicinity of Unalaska that must be submitted to a specialist for determination.

Sixteen islands of the Aleutian chain were explored for plants and quite thorough collections made on most of the principal islands. This group of islands is beset with much difficulty and danger for an explorer. During most of the year they are drenched in heavy fogs or lashed by storms and strong currents. High cliffs and dangerous reefs make many of the islands inaccessible except in rare intervals of calm weather. The boat that we chartered named "Eunice", of the Alaska Commercial Company, ran onto the rocks on Carlisle Island in the Four Mountain Group. This happened a few days after we left her. The crew was picked up by one of the coast guard vessels ten days later on Umnak Island.

Most of the islands are uninhabited and rarely visited. There are only about 300 people west of Unalaska to Attu Island, a distance of about 1,200 miles. There are now only 37 people at Attu village.

I learned of two localities where sea otters are on the increase. The best of these is amongst the Sitkin Islands between Atka and Adak Islands. The other locality is amongst the extensive kelp beds of the reefs jutting out from the Sanak Islands near Alaska Peninsula. A constant menace to the sea otters amongst the Sitkin Islands are Japanese poachers generally commanded by a white man.

Collections of shells were made at King Cove, Alaska Peninsula, False Pass (Izanotski Strait), Unimak Island, Akutan Island, Amoknak Island, Unalaska Island, Amlia Island and Atka Island. The Aleutians are poor in land shells and the only large species are *Polygyra columbiana columbiana* Lea and *Haplotrema vancouverensis* Gould (typical), which are quite common in the vicinity of Unalaska village. I collected over 300 live shells of these two species in an hour in one spot and found many dead shells which had been eaten by voles or field mice. These gnawed shells were to be found by handfuls at the entrance of many of the burrows of Nushagak ground squirrels which are plentiful on Unalaska Island.

Dr. G. D. Hanna in NAUTILUS, Vol. XXXVIII, No. 4, pages 122-125, of April, 1925, in a report entitled "Some Land Shells from the Aleutian Islands, Alaska", records the occurrence of these two species from the above spot. His other records also coincide with the localities where I found them and I saw them nowhere else in the Aleutian chain or Alaska Peninsula. These two species may occur on Kodiak Island but in four excursions to that island and Afognak Island, I have never found one. At Drier Bay, Knight Island, Prince William Sound, I found them only in one place and that was always under boards or building paper. In southeastern Alaska and throughout the Vancouverian province they are common enough.

Dr. Hanna was of the opinion that these two species of snails must be native to Unalaska Island as is also his view pertaining to certain species of insects belonging to the Vancouverian fauna. This theory does not hold good for the flora, however, which is strongly Arctic and Kamchatkan. I believe that the two above mentioned snails have been introduced, as they are both hardy breeds which could easily have been transported with introduced plants, in crevices of timber, vegetables, etc. In all localities, where I found them in Alaska they were always in the vicinity of villages or abandoned human habitations. Unalaska and Dutch Harbor have been in contact with civilization for more than 150

years so there has been plenty of time to accidentally introduce a few hardy snails and insects from southeastern Alaska and other localities. The occurrence of *P. columbiana* and of *H. vancouverensis* at Makushin Bay, Unalaska Island, I do not think very remarkable as Dr. Hanna does. They could easily have been brought by human agency from Unalaska or points farther south. I believe that if they are really natives of Unalaska of long residence they should be found on other islands of the Aleutian chain and should occur farther removed from human habitations than they do in these parts.

The Aleutians are extremely poor in land shells and most of those that do occur are tiny shells with wide northern range.

Prophysaon andersoni (J. G. Cooper) is very common around the town of Unalaska and adjacent Amoknak Island a couple of hundred yards away. It is a great pest to the few vegetable gardens. It has probably been introduced with cabbage or other vegetables.

Succinea chrysis Westerlund I found in wet places at Unalaska, Atka and False Pass, Unimak Island. It is only about one-third the size of the fine big golden specimens that I found at Uganik Bay, Kodiak Island. This form in the Aleutians approaches *S. grosvenori* Lea.

Most of the small land shells in the Aleutians can readily be found under the huge umbellifer, *Heracleum lanatum,* which is distributed abundantly throughout the island group. *Gonyodiscus cronkhitei* Newcomb, *Punctum conspectum* Bland., *Zoogenites harpa* (Say), *Retinella binneyana* (Morse), *Vertigo modesta* Say, *Columella alticola* (Ingersoll), *Vitrina alaskana* Dall, *Pristiloma arctica* (Lehnert) and *Euconulus fulvus alaskensis* Pilsbry were found at Unalaska Island. Several of these species were also taken on Unimak Island and Atka Island.

Two large collections of freshwater shells were made from lakes on Unimak Island and Amlia Island as well as smaller one from Unalaska and Atka Islands. These have not yet been positively identified but will be submitted for publication later.

CHARLES WILLISON JOHNSON, 1863-1932

BY ARTHUR F. GRAY

Charles Willison Johnson, Senior Curator of the Boston Society of Natural History for about thirty years, a man of clear vision and of tremendous value to the whole of New England, has passed on. An eminent scientist, well-versed in the studies of entomology, malacology and paleontology, as well as in the broader field of general natural history, he will be greatly missed not only by the local society in which he worked, but in a much larger sense by the scientific world of America.

As a specialist, he had attained an enviable reputation among his colleagues and co-workers in the branches to which he had devoted the better portion of his years.

Born at Morris Plains, Morris County, New Jersey, October 26th, 1863, the son of Albert Fletcher and Sarah (Willison) Johnson, he received his earlier education in public and private schools at Morristown, New Jersey; his later education in the higher schools of opportunity, experience and human progress. An apt scholar, he early developed a remarkable aptitude for, and keen interest in, the nature studies which were to form his principal interests and life-work.

Removing in 1880, at the age of seventeen, to St. Augustine, Florida, he became deeply interested in natural history and especially in the Tertiary deposits of the state. He made extensive collections of fossils from these beds. Here also he met Mr. Joseph Willcox, then a Trustee of the Wagner Free Institute, of Philadelphia, who was so deeply impressed with the knowledge of general natural history shown by Mr. Johnson, that he engaged him to take up the position of Curator at that institution.

While at St. Augustine, he met Dr. William H. Dall of the National Museum, who was making studies of the Tertiary deposits, and gathering material for his important work on the "Tertiary Fauna of Florida", which appeared later in the Transactions of the Wagner Free Institute of Phila-

delphia, 1890-1895. The friendship then formed continued until Dr. Dall's death.

In the latter part of 1888, we find Johnson, at the age of twenty-five, installed in his new position at the Wagner Free Institute, as Curator of a museum containing the accumulations of many years, of decidedly mixed character. This the new Curator proceeded to overhaul; much was discarded. With the remainder, which contained some very excellent material as a nucleus, he built up a museum that is extremely valuable and instructive. All of this was accomplished during a period of about fourteen years.

While resident of Philadelphia, Johnson was made Curator of the Eocene and Oligocene collection made by Dr. Isaac Lea, at the Academy of Natural Sciences. Here he became associated with Dr. Henry A. Pilsbry, Curator of Mollusca and Marine Invertebrates in the Academy. Together they made several excursions in the field, collecting Cretaceous fossils in New Jersey; and living mollusks in St. Johns River, Florida, where they spent a month together in 1894, bringing back new species which were later described in THE NAUTILUS. In the interest of the Academy he visited the famous beds of Eocene remains at Claiborne, Alabama, those at Jackson and Vicksburg, Miss., also many localities in Alabama, Louisiana, Texas and Arkansas. From all the beds he gathered large quantities of material, most of which he classified and labeled in the Academy's collection in Philadelphia.

In May, 1890, Johnson joined with Dr. Pilsbry in the publication of THE NAUTILUS as Business Manager, taking the place of W. D. Averell, who, with Pilsbry, had established the journal a year before. The choice was most fortunate; Johnson established the most cordial relations with subscribers and contributors. During extended periods, when Dr. Pilsbry was away on collecting trips, he acted as editor as well as business manager. In those days THE NAUTILUS was a monthly. This co-partnership and intimate friendship continued for forty-two years, until terminated by Mr. Johnson's death.

Early in 1891, Johnson visited the Island of Jamaica with Mr. William J. Fox, both collecting shells and insects. Among the land shells brought home were several that were afterwards described and published as new.

Mrs. Johnson's father, Mr. John Ford, has been an ardent collector of shells, and had accumulated a large and valuable collection, which, at his death, came into Mr. Johnson's hands. He found it particularly rich in Olividae, of which Mr. Ford had gathered lavishly. Becoming deeply interested in the family, Mr. Johnson published "Some Notes on Olividae". Boston Soc. Nat. Hist., 1910-1911. Further notes on the family appeared from time to time in THE NAUTILUS.

Following the death in 1903 of Prof. Alpheus Hyatt, who had been in charge of the museum for a long period, Mr. Johnson was called to the Boston Society of Natural History to fill the office of principal Curator. He accepted the position in the fall of that year. Arriving at Boston, he found the museum in a static condition, crowded to overflowing and sadly in need of a thorough overhauling and weeding process; he took up this work immediately. Conceiving the need of improving the New England collections, he had new and modern cases installed, and built up these departments, filling the gaps. His efforts have been crowned with great success; the museum is now in excellent condition.

A strong, earnest and active field-worker, he camped out in New Hampshire, Vermont, and other points in New England each summer. He visited Mt. Washington, the islands of Mt. Desert, Nantucket, and other important areas, building up the collection of New England insects, now without doubt the finest in existence. During his long service here in Boston he gave great attention also to the study of the New England molluscan fauna; building up a very complete series of the local shells; at the same time contributing much to our knowledge of synonomy, ecology, habits and the general distribution of New England mollusks. A summary of this work was published in the "Fauna of New England Series," No. 13 (Boston Soc. N. H., 1915).

Deeply interested in the study of insects, he became a recognized authority on the Diptera, or two-winged flies. He collected these in many and widely distributed areas, preparing extensive lists of the Diptera of Bermuda, Jamaica, New Jersey, New York, New England and Labrador. These lists have been of the greatest use to workers in this line of study. He was consulted widely, and with great frequency relative to this highly organized and often injurious group of insects. Johnson's private collection of insects is now in the Museum at Harvard University.

He was a fellow of the American Academy of Arts and Sciences; a member of American Association for the Advancement of Science; of the Academy of Natural Sciences, of Philadelphia; of the Entomological Societies of America, Washington, and Cambridge; the Boston Society of Natural History; the Malacological Society of London; the Boston Malacological Club, and others.

When the Boston Malacological Club was formed in March, 1910, he was one of the organizers. He always took a great interest in its meetings, seldom being absent therefrom. He served continuously on its executive committee, and for several years as its president. The papers presented by him at its meetings have been frequent and of great interest. The accounts of his shell collecting trips, disclosed his sense of humor; his adventures and experiences during these trips were often amusing and highly entertaining.

The Club's November meeting was a memorial to Mr. Johnson, and many papers were presented relative to his various interests, his fine and lovable character, his kindness and willingness to share his fund of knowledge alike with the beginner or the highly-trained specialist; his scholarly methods of study; his great value as a Curator; and his many contributions to science. Among the speakers who paid tributes, were: Dr. Thomas Allen, William J. Clench, S. N. F. Sanford, J. Henry Blake, Prof. Francis N. Balch and Dr. Joseph Bequaert, the president. Letters were also read from Dr. Pilsbry and Dr. Fred T. Lewis. In his death the Club has lost one of its most efficient workers, a

man of unusual accomplishments, yet of extreme modesty and a kindly and affectionate spirit, a Christian gentleman, dear friend and lovable companion. The Club members will long cherish his memory.

I take the liberty of quoting a few excerpts from the letter of Dr. Lewis, whose remarks therein seemed most fitting. He says:

"The door of Mr. Johnson's room was always open. Whenever any one,—school-boy, expert, old friend or stranger—crossed the threshold his work was laid aside. His time and wealth of information were at every one's disposal. Often I have visited there, and never without learning much and developing a taste for more, as with the utmost simplicity Mr. Johnson drew upon his boundless lore of insects and mollusks. His detailed knowledge of the groups in which he was specially interested was impressive. For him there was no idle time. When absent from the Museum he was always off collecting."

Of his writings on scientific subjects Mr. Johnson apparently never kept a list. Dr. Bequaert says that his contributions on entomological topics numbered some 130 papers; and Mr. Sanford estimates that at least 100 papers were contributed on molluscan subjects. He also wrote several papers and notes relative to the fossils of the Tertiary, Cretaceous and other formations from which he had made collections.

He married at Philadelphia, Pennsylvania, January 14th, 1897, Miss Carrie W. Ford, the daughter of John Ford, the well-known conchologist of that city. She died at Brookline, Mass., July 16th, 1931, about a year before the death of Mr. Johnson, which occurred after a brief illness of about three weeks' duration at his home in Brookline, on July 19th, 1932. They left no children.

Johnson was much loved and respected in the community where he had spent the greater portion of the time, since he took up his residence in Brookline. He served as a vestryman in St. Mark's Methodist Episcopal Church. Of a genial and lovable nature, the community has lost an exemplary

citizen, and we, who were his co-workers in scientific lines, a dear friend and companion.

DR. VICTOR STERKI, 1846-1933

BY STANLEY T. BROOKS, PH.D.

Dr. Victor Sterki, internationally-known as a conchologist and well-known as a protozoologist, died in his eighty-seventh year at his home in New Philadelphia, Ohio, on January the twenty-fifth.

Dr. Sterki was born at Solothurn, Switzerland, in 1846. He was the son of Anton and Magdalena Müller Sterki. His first classes were attended in the building in which his grandfather had taught for twenty-nine years. Later, after five years in high school and two years in college, he entered the University of Bern as a medical student. Before this time, however, his love for nature had been expressed in his many studies and collections of the native flora and fauna. Several "Tagebücher", written during those days, tell of his collections of plants and mollusks.

Young Victor Sterki was never robust, and at the end of his medical course suffered a long illness. The winter following was spent in Munich (University) studying the Protozoa, and in the spring of that year he took the examinations that would permit him to practice medicine. He did not obtain his M.D. degree until later.[1] After taking the examination, which he passed with highest honor, he served

---

[1] "In Switzerland, as well as in other European countries, the medical student has to pass a 'State Examination' which entitles him to practice as a physician. This examination has nothing to do with the 'Dr. Med.' which is solely an academic degree, and involves not the right of practice. But most physicians graduate for the title; and the universities may, under circumstances, grant the 'M.D.' to an applicant, after he has passed the state examination satisfactorily, upon a good dissertation, and the fee required, without another formal examination. As Botany and Zoology, with comparative anatomy, are comprised in the first or propaedeutic part of the examination, a dissertation on such a subject could be accepted."

These notes appeared in the introduction of his little book written in 1895 and entitled, "Notes and Observations after Twenty Years' Medical practice in the Old and New World".

as polyclinical, then as clinical assistant at the eye hospital of the University of Bern. Previous to this, while he was still attending his medical course, he had held the position of assistant of the Pathological Institute. This was in 1873, and in 1874 he went into practice for himself. It had been his desire throughout his medical studies to go as a ship's surgeon, but his acceptance of the work at the clinic stayed him. While holding these positions, he studied his beloved Infusoria, and in 1878 he received his degree of Doctor of Medicine upon a dissertation on the morphology of the *Oxytrichina*. This work is a classic in its field, and caused many of the prominent zoologists, among them Bütschli, to enquire of this young student and to commend him upon his very valuable work.

The year following his entry into practice Dr. Sterki married Miss Mary Lanz of Huttwyl, Switzerland, and came to the United States in 1883. Settling in New Philadelphia, Ohio, to begin a medical practice in the New World, he was stimulated to greater efforts in the study of nature than ever before. First, he began a collection of the minute Gastropoda, especially the Pupillidae. In 1909, he was appointed Assistant in the Section of Recent Invertebrates of the Carnegie Museum (under Dr. A. E. Ortmann, Curator), a position he held (in absentia) until the time of his death. Since 1909, Dr. Sterki spent most of his spare hours upon his collection of Sphaeriidae. However, he found time for the study of Protozoa, mosses, other land and water mollusks, and for working in his garden, which was as well described in his note books as are some of his shells.

Dr. Sterki's work began a new period in the study of Pupillidae and of Sphaeriidae in America. Both groups had been neglected for many years, and neither had ever been studied with the insight and the meticulous attention to detail which his critical mind brought to bear upon them. Collectors all over the country were enlisted to gather material for his studies. His work on these groups give him a prominent place among the American conchologists of his generation.

The collection of *Sphaeriidae*, numbering over twelve thousand identified and catalogued lots, resides in the Laboratory of Recent Invertebrates of the Carnegie Museum along with his collection of *Pupillidae* and numerous other collections from America and elsewhere.

The papers from his pen number some 151, in the list compiled by the writer up to the present time. As far as I know, Dr. Sterki did not keep a bibliography. The number of new species described, according to his own notations, is over one hundred. Nearly one hundred descriptions are still in manuscript form, and will be brought out in due time.

As I sit here surrounded by the many cases of shells, fossils, and his library of more than a thousand pamphlets and bound volumes, I see more of the true lover of nature than the medical practitioner. Dr. Sterki was an earnest student of mollusks throughout his life. My own friendship with him during the last three years leads me to characterize him as a man of very genial and hospitable manners, always agreeable and unpretentious. The world has lost a great collector and an untiring student as well as a friendly, helpful man. He is survived by two daughters and a son. One daughter died in December of this past year, seemingly hastening her father's end.

JOHN K. STRECKER

BY L. S. FRIERSON

John K. Strecker, curator of the Baylor University Museum, Waco, Texas, and Librarian during a term of almost thirty years, died at his home, January 9th, 1933. Few men have ever been born ready made naturalists, as was John K. Strecker. Few indeed are the reptiles, mammals, birds, or mollusks of Texas which he did not know. He became a member of many scientific societies concerned with mammals, birds, reptiles and others which fostered the study of nature. He wrote innumerable articles concerning

the living things of Texas, and made friends of those with like tastes by the score. He combined all these pursuits with local politics, being Chairman of the Democratic Executive Committee during twenty years.

"The Naiades or Freshwater Pearly Mussels of Texas", 1931, was Mr. Strecker's principal conchological publication,—a critical catalogue of permanent value.

PUBLICATIONS RECEIVED

EIN VORKOMMEN DES AMERIKANISCHEN HELISOMA TRIVOLVIS SAY IM PLEISTOCENE DES FLUSSES KOLYMA (NORDOST-SIBERIEN). By W. A. Lindholm. (Academy of Sciences, U.S.S.A., Work of the Council and the Study of Natural History, No. 11, p. 65.) Herr S. V. Obrutschev, in the course of geomorphologic work in extreme N.-E. Siberia, found a deposit of freshwater shells in the right bank of the Kolyma River beyond the Arctic Circle. Lower layers contained remains of mammoth, elk, reindeer, bison and horse. Besides the *Helisoma* and *Lymnaea stagnalis*, 8 palaearctic species of *Anodonta, Sphaerium, Pisidium, Valvata, Bithynia* and *Radix* occurred. Many of the shells still retain the periostracum. It is the first occurrence of *Helisoma* outside of America, and lends support to the view that there was a land bridge over Bering Sea in the Pleistocene. On account of some small differences the Siberian specimens are described as *Helisoma trivolvis kolymense* Lindh.—H. A. P.

THE LAND SNAIL GENUS CARELIA. By C. Montague Cooke, Jr. Bull. 85 Bernice P. Bishop Museum, 97 pp., 18 pl. This study is based on a collection of nearly 5,500 specimens. Twenty species and 9 subspecies are recognized, 10 species and 9 subspecies being described as new, more than doubling the number known before. All of the forms are fully described and figured, and keys are given for determination of specimens. The species are classified in six groups based

upon characters of the embryonic shells, the descent of the whole series from an amastrine stock being illustrated by a phylogenetic diagram.

Carelia comprises the largest land snails of the Hawaiian Islands, *C. turricula* and *C. pilsbryi* reaching a length of over 80 mm. It is restricted to the island of Kauai and its satellite Niihau. Dr. Cooke believes that it reached its fullest development in Pleistocene times, 12 of the 29 known species and races being now extinct. In former works few of the species were exactly localized, but the collections of the last ten years enabled Dr. Cooke to give a good account of their distribution, and to present a map showing the ramifications of the several groups.—H. A. P.

Observations on the Life History of a Finger-nail Shell of the Genus Sphaerium. By Thural Dale Foster. Journ. of Morphology, Sept., 1932. *S. solidulum* was investigated during 12 months. Among other interesting results, the life span was found limited to one year. Maximum reproduction occurs during winter months. Embryos are found in individuals that have attained half of the maximum adult size, and individuals of maximum size are apparently sterile.—H. A. P.

Studies on the Life Cycle of the Snail Viviparus contectoides. By Harley J. Van Cleave and Ludwig G. Lederer. Journ. of Morph. 53: 499-522. Sept., 1932. Marked sexual dimorphism was found, the males smaller, none over 25 mm. long found, while the largest female was 40.7 mm. The males live but little more than one year, the females about three years.

Mollusks of Keweenaw County, Michigan. By Calvin Goodrich. Occ. Pap. Mus. Zool. Univ. Mich. No. 233. No records existed previously for this county, where the rock is mainly igneous and the cover coniferous. Eight terrestrial and 9 aquatic forms were found. The effects of shortage and abundance of lime are marked in some forms, such as the small *Polygyra albolabris maritima* and a very large form of *Elliptio complanatus,* the latter figured.—H. A. P.

SOME DATA ON THE GROWTH, LONGEVITY AND FECUNDITY IN LYMNAEA COLUMELLA SAY. By Joshua L. Baily, Jr. Biologia Generalis, vol. 7, pp. 407-428. Growth was found to be regular and satisfactorily represented by a logistic curve. Duration of life is inversely associated with maximum growth rate. Egg production is directly associated with limiting shell size and duration of life. The material used was from one clutch of eggs which hatched Jan. 4-6; egg laying began in 50 to 64 days. The last individual died on the 139th day.—H. A. P.

A MIOCENE MOLLUSK OF THE GENUS HALIOTIS from the Temblor Range, California. By W. P. Woodring. Proc. U. S. National Mus., vol. 81, Art. 15. *Haliotis lasia*, n. sp., reaches a length of 75 mm. and has some resemblance to *H. fulgens* and also to the *H. tuberculata* group. *H. palaea* Woodring is the only other American Miocene Haliotis known.—H. A. P.

THE ECOLOGY OF SAY'S LIMNAEUS ELODES. By F. C. Baker. Ecology, vol. 13, p. 286. This form described from "Lake Canandaigua" is not a lake species. The author found it in a beach pond on the east side, about 3 miles south of the city of Canadaigua. The conditions are described.

NOTES AND NEWS

A NEW OUTBREAK OF HELIX PISANA IN CALIFORNIA.—Some shells, sent to me for identification during May, 1932, by Mr. H. H. Keifer of the State Department of Agriculture, proved to be the familiar pest, *Helix pisana*, long known from San Diego County. The particular specimens sent came from Orange County and upon application to Mr. Keifer for further information, he supplied the following notes:

"The Orange County infestation was discovered as a result of the alfalfa weevil survey. On May 12, 1932, the first alfalfa weevil was found in the vicinity of Tracy, San Joaquin County, and an immediate survey of all fields throughout the state was begun. An Orange County agricultural inspector, while sweeping alfalfa near Seal Beach,

May 18, 1932, found *Helix pisana* in great numbers. A survey to learn the extent of the infestation was begun at once by both Orange and Los Angeles county authorities. The original location was determined to be a part of an area half a square mile in extent. A small spot was found nearer the ocean and another, north, just over the Los Angeles County line. Two small infestations were found about 12 miles inland; one between Midway City and Garden Grove; the other between Garden Grove and Stanton. Eradication measures have already been undertaken and the original alfalfa field has been plowed up and set to beets. There is now an appropriation measure before the legislature to enable the State Department to co-operate with Orange County in this work. Alfalfa was the principal host in this case but there were other plants attacked."

It is to be hoped that nothing will interfere with the extermination of these colonies because the experience had in San Diego County shows conclusively that the species is a very dangerous pest and extremely difficult to eradicate completely. It seems particularly well adapted to the climate of southern California.—G. D. HANNA.

THE CASE OF HAMINOEA VIRESCENS (Sowb.).—*Bulla virescens* Sowerby was defined by two figures in Sowerby's Genera of Shells, published about 1833. No locality was given. Subsequently A. Adams gave the locality "Pitcairn Island" for another specimen identified as the same species in Cuming's collection. As Sowerby's figures agree fully with a common Californian *Haminoea,* the name *H. virescens* Sowb. was used by practically all authors up to the time of Dall's Bulletin 112 (1921). Subsequent names are *H. dalli* Bartsch, a nude name which will date from its inclusion by Grant and Gale in *H. cymbiformis* (Mem. San Diego Soc. N. H. 1: 458, 1931), and *H. strongi* Baker and Hanna, 1927, which I have not seen. It is identical with *H. virescens* of Californian authors according to Grant and Gale. The last authors adopt the name *H. cymbiformis* Cpr. This was based on one rather imperfect specimen from Mazatlan, which

measured .07 x .05 inch (that is, about 1¾ mm. long), whitish, ornamented with very close spiral striae.

So far as I know, no Polynesian record for *H. virescens* exists except that in the Cuming collection. It is common knowledge that Cuming's localities are highly unreliable. In dealing with the species collected by himself in South America, the Panamic province and the Philippines the localities can mostly be trusted; these things were described immediately after his return from the field. But practically all other Cumingian records require confirmation from other sources, as literally hundreds of them have been proven erroneous.

That this delicate shell was collected on the precipitous rocky shore of Pitcairn Island, where even landing is very difficult, seems improbable (See Captain Beechey's Narrative Voy. to Pacific and Beering's Strait, p. 72, and plate opposite). *Haminoea* is usually found, in my experience, under much quieter conditions, not on rocky, surf beaten shores.

It appears to me that the identification of *H. virescens* with the well-known Californian shell is in all probability correct. I very much doubt the possibility of a certain identification of Carpenter's minute and imperfect *H. cymbiformis* at present, though with an exhaustive collection from Mazatlan a probable identification might be made. It was one of the many scientifically worthless enigmas with which Carpenter encumbered the literature of the Gulf district.

It may be added that Dr. Grant informs me that he now considers *Haminoea strongi* Baker & Hanna specifically distinct from *H. virescens*.—H. A. P.

BULIMUS TENTACULATUS (L.) (*Bithynia tentaculata*) LIVING IN THE POTOMAC RIVER.—How it came here no one can tell. It may have come on water plants brought here for use in aquaria or water-gardens. It may have come from Europe, its native home, or from localities in America where it has become established. In any case, it has taken up its residence here. The full record of the species in the Potomac to this date, Oct. 26, 1932, is as follows:

May, 1927. Two dead specimens at Hunter's Point, near

Alexandria, Va., collected by Dr. W. P. Woodring.[1] Academy of Natural Sciences, Phila., No. 143310.

May 27, 1932. Two dead specimens about 1½ miles above Mt. Vernon, Va., collected by Mrs. Imogene C. Robertson, Financial Secretary of the American Malacological Union.[2] Academy of Natural Sciences, Phila., No. 158917.

May 27, 1932. Two dead specimens, part of lot collected by Mrs. Robertson. U. S. Nat. Museum, No. 424154.

June 4, 1932. Four *living* specimens, close to Jones' Point Light House, below Alexandria, Va., collected by Dr. B. G. Chitwood, who did not know that Mrs. Robertson had found specimens just a week before. He said they were not uncommon. U. S. Nat. Museum No. 424155.

July 30, 1932. Twelve living specimens, all in fine condition, collected at the preceding locality by Dr. Chitwood. He said he could not find them at several places farther south nor at places above Alexandria. U. S. Nat. Museum, No. 424210.

For every-day purposes we would say all the localities mentioned are in Virginia. Speaking politically and legally, we should be uncertain whether they were in Virginia or in the District of Columbia and Maryland, for the boundaries lie on the Virginia shore and not in the middle of the river. —Wm. B. Marshall.

A Variable Colony of Monadenia fidelis (Gray).— At Endert's Beach, 5 miles south of Crescent City, Calif., there is a colony of *M. fidelis* which shows an unusual amount of variation in color, size and height of spire. This colony is living on the bluff, facing the beach, just south of where Ragged Creek flows into the ocean.

In 1919 and 1920 the Redwood Highway was built along the face of this bluff about 100 feet above high tide line, and a good deal of dirt and rock was dumped down the bluff at that time. Patches of low brush, poison oak and weeds have grown on this dumped material but nowhere form the thick cover with which we have usually associated *fidelis*. In one

[1] The Nautilus, October, 1932, p. 69.
[2] The Nautilus, July, 1932, p. 2.

place a large quantity of coarse rock was dumped forming an open rockslide. Only three or four *fidelis* were found along this bluff in the early fall. The first rains brought the snails out of their hiding places, and had we wished to we could have collected 300 in an hour's time, many of them on the open rock slide.

The wide range of color immediately caught our attention and a study of the series taken shows that there are 8 definable color patterns with many intergrades. These are:

(1) Dark base with dark top (dark brown to red brown).

(2) Dark base with multilineate top.

(3) Dark base with lemon yellow top.

(4) Light (lemon yellow) base with dark multilineate top (1 only).

(5) Light (lemon yellow) base with light multilineate top.

(6) Light (lemon yellow) base with lemon yellow top.

(7) Base light at the umbilicus shading to brown toward the periphery with light multilineate top.

(8) Base light at the umbilicus shading to brown towards the periphery with lemon yellow top.

These all have the dark band at the periphery bordered by narrow light bands in the darker specimens.

The variation in size and proportion is shown by this table.

Shell No.	Greater diam.	Lesser diam.	Height of spire*	Height of shell†
(1)	37.0 mm.	30.5 mm.	17.3 mm.	23.2 mm.
(2)	36.4 mm.	30.1 mm.	19.6 mm.	27.4 mm.
(3)	35.8 mm.	28.5 mm.	16.4 mm.	21.8 mm.
(4)	35.8 mm.	29.5 mm.	18.0 mm.	25.4 mm.
(5)	32.1 mm.	26.2 mm.	17.2 mm.	23.6 mm.
(6)	27.0 mm.	21.8 mm.	12.0 mm.	16.7 mm.

* Umbilicus to apex. † Lowest point of lip to apex.

Measurements of 77 specimens show that 14% are less than 30 mm. in greater diameter and 45% are less than 32 mm. in greater diameter.

Shells taken in the nearby canyon of Ragged Creek, where the cover is much heavier, show less variation in size and a

little less in color, though even here the lighter colored forms are much more common than in any other colony that we know. This is probably a part of the same colony, as in this territory where a few *fidelis* may be found almost anywhere in moist weather it is very difficult to place definite boundaries on a colony.—E. P. and E. M. CHACE.

CRASSISPIRA BOTTAE Val.—In January, I took on a sand bar in Newport Bay, Calif., a fine living specimen of this species, new to our fauna and which, according to Mr. Lowe is not plentiful in its home waters, the Gulf of California. The specimen is more slender than the specimens he collected in the Gulf but in other respects seems identical.—MORRIS E. CARUTHERS.

AMERICAN MALACOLOGICAL UNION

THIRD ANNUAL MEETING, in Cambridge, Massachusetts, Thursday, Friday and Saturday, May 25, 26 and 27, 1933.

HEADQUARTERS, Hotel Continental, Cambridge. Special rates have been obtained, $2 and $4 for single or double rooms.

REGISTRATION, Thursday a. m., at Department of Mollusks, Museum of Comparative Zoology, Oxford Street, Cambridge.

All members expecting to give papers will please submit full title, time required, and type of lantern to be used, if any, not later than May 5, to W. J. Clench, Museum of Camparative Zoology, Cambridge, Mass.

The fact that this year's meeting is to be held in Cambridge, offers an opportunity to see not only Harvard University, and the many places of historic and literary interest in Cambridge and Boston, but also such near-by towns as Concord, Salem and Plymouth.

$2.00 per Year ($2.10 to Foreign Countries.) 50 cts. a copy

THE NAUTILUS

A QUARTERLY
DEVOTED TO THE INTERESTS
OF CONCHOLOGISTS

EDITORS AND PUBLISHERS:

H. A. PILSBRY, Curator of the Department of Mollusca,
Academy of Natural Sciences, Philadelphia.

C. W. JOHNSON, Curator of Insecta and Mollusca, Boston Society of Natural History.

Vol. XLVI. JULY 1932 No. 1

CONTENTS

C. W. JOHNSON, Business Manager,
Boston Society of Natural History,
234 Berkeley Street,
Boston, Mass.

Entered as Second-Class matter at the Boston Post-Office.

EXCHANGE NOTICES

FOR EXCHANGE: Fifteen varieties, Florida tree snails (*Liguus*) including three of the rare *solidus*, to exchange for Achatinella, Amphidromus, Bulimulus, Cochlostyla, Orthalicus, Porphrobaphe and Placostylus. Send your list to

PAUL P. MCGINTY, 9010 Dexter Bl'd, Detroit, Mich.

WANTED: Planorbis of the Helisoma group especially from Florida, Louisiana and other Southern States. Material will be either paid for or received in exchange. F. C. BAKER, Natural History Museum, University of Illinois, Urbana, Ill.

WANTED: Back Volumes and Numbers of THE NAUTILUS. Especially Vols. 3, 4, 18, 20, 21, 22, 23 and 24. Address

THE NAUTILUS, 234 Berkeley, St., Boston, Mass.

FOR EXCHANGE: European and Foreign Shells (recent and tertiary) for species new to me. Please *send full list of duplicates* when writing.

J. D. STAED, 123 rue Clovis, Rheims Marne, France.

AN ANNOUNCEMENT!

The Index to The Nautilus—Part II

A continuation of the Index to THE NAUTILUS, with an additional Geographically arranged subject index, is nearing completion. Part II covers the issues from 1921 to 1931 (volumes 35 to 44 inclusive). It is planned to issue this index every ten years.

The forthcoming index will be printed on a good grade of Book paper and unless otherwise requested (with additional charge) will be bound with paper backs. The size will be the same as the Index published by George H. Clapp and Bryant Walker in 1927, and will consist of well over 100 pages with nearly 15,000 entries.

Due to the great amount of labor and the expense of publishing, it will be necessary to sell this issue of the index by subscription. The number printed will depend on the number of subscribers of THE NAUTILUS that order their copies within the next month or two. Please send orders promptly to STANLEY T. BROOKS, Curator of the Laboratory of Recent Invertebrates of the Carnegie Museum, PITTSBURGH, PENNSYLVANIA, U. S. A.

In order to facilitate the publication of the continuation of the Index to THE NAUTILUS please sign the following order:—

I hereby promise to pay upon receipt of the published work, by check or money order, a sum not to exceed three ($3.00) dollars. Special binding not included.

I also understand that if there is an insufficient demand and support by the Malacologists and other interested individuals and institutions this Index will *not be printed* and no responsibility will remain between the contracting parties.

Signed,.....

$2.00 per Year ($2.15 to Foreign Countries.) 50 cts. a copy

THE NAUTILUS

A QUARTERLY
DEVOTED TO THE INTERESTS
OF CONCHOLOGISTS

EDITORS AND PUBLISHERS:

HENRY A. PILSBRY, Curator of the Department of Mollusca, Academy of Natural Sciences, Philadelphia.

H. BURRINGTON BAKER, Associate Professor of Zoology, University of Pennsylvania.

Vol. XLVI. OCTOBER, 1932 No. 2

CONTENTS

HORACE B. BAKER, Business Manager,
Zoological Laboratory, University of Pennsylvania,
38 Woodland Avenue, Philadelphia, Pa.

Entered as Second-Class matter at the Boston Post-Office.
Application pending transfer to Philadelphia, Pa.

EXCHANGE NOTICES

FOR EXCHANGE: Fifteen varieties, Florida tree snails (*Liguus*) including three of the rare *solidus*, to exchange for Achatinella, Amphidromus, Bulimulus, Cochlostyla, Orthalicus, Porphyrobaphe and Placostylus. Send your list to

PAUL P. MCGINTY, 9010 Dexter Bl'd, Detroit, Mich.

WANTED: *Planorbis* of the *Helisoma* group from California, Oregon, and Washington, particularly with the animal. Exchanges offered in material from Arizona, Mexico, and South America. F. C. BAKER, Natural History Museum, University of Illinois, Urbana, Ill.

WANTED: Back Volumes and Numbers of THE NAUTILUS. Especially Vols. 3, 4, 18, 20, 21, 22, 23 and 24. Address

HORACE B. BAKER, Zool. Lab., Univ. Pennsylvania.

FOR EXCHANGE: European and Foreign Shells (recent and tertiary) for species new to me. Please *send full list of duplicates* when writing.

J. D. STAED, 123 rue Clovis, Rheims, Marne, France.

AN ANNOUNCEMENT!

The Index to The Nautilus—Part II

A continuation of the Index to THE NAUTILUS, with an additional Geographically arranged subject index, is nearing completion. Part II covers the issues from 1921 to 1931 (volumes 35 to 44 inclusive). It is planned to issue this index every ten years.

The forthcoming index will be printed on a good grade of Book paper and unless otherwise requested (with additional charge) will be bound with paper backs. The size will be the same as the Index published by George H. Clapp and Bryant Walker in 1927, and will consist of well over 100 pages with nearly 15,000 entries.

Due to the great amount of labor and the expense of publishing, it will be necessary to sell this issue of the index by subscription. The number printed will depend on the number of subscribers of THE NAUTILUS that order their copies within the next month or two. Please send orders promptly to STANLEY T. BROOKS, Curator of the Laboratory of Recent Invertebrates of the Carnegie Museum, PITTSBURGH, PENNSYLVANIA, U. S. A.

In order to facilitate the publication of the continuation of the Index to THE NAUTILUS please sign the following order:—

I hereby promise to pay upon receipt of the published work, by check or money order, a sum not to exceed three ($3.00) dollars. Special binding not included.

I also understand that if there is an insufficient demand and support by the Malacologists and other interested individuals and institutions this Index will *not be printed* and no responsibility will remain between the contracting parties.

Signed,.....

$2.00 per Year ($2.15 to Foreign Countries.) 50 cts. a copy

THE NAUTILUS

A QUARTERLY
DEVOTED TO THE INTERESTS
OF CONCHOLOGISTS

EDITORS AND PUBLISHERS:
HENRY A. PILSBRY, Curator of the Department of Mollusca, Academy of Natural Sciences, Philadelphia.
H. BURRINGTON BAKER, Associate Professor of Zoology, University of Pennsylvania.

Vol. XLVI. JANUARY, 1933 No. 3

CONTENTS

HORACE B. BAKER, Business Manager,
Zoological Laboratory, University of Pennsylvania,
38 Woodland Avenue, Philadelphia, Pa.

Entered as Second-Class matter at the Boston Post-Office.
Application pending transfer to Philadelphia, Pa.

EXCHANGE NOTICES

FOR EXCHANGE: Fifteen varieties, Florida tree snails (*Liguus*) including three of the rare *solidus*, to exchange for Achatinella, Amphidromus, Bulimulus, Cochlostyla, Orthalicus, Porphyrobaphe and Placostylus. Send your list to

PAUL P. MCGINTY, 9010 Dexter Bl'd, Detroit, Mich.

WANTED: *Planorbis* of the *Helisoma* group from California, Oregon, and Washington, particularly with the animal. Exchanges offered in material from Arizona, Mexico, and South America. F. C. BAKER, Natural History Museum, University of Illinois, Urbana, Ill.

WANTED: Back Volumes and Numbers of THE NAUTILUS. Especially Vols. 3, 4, 18, 20, 21, 22, 23 and 24. Address

HORACE B. BAKER, Zool. Lab., Univ. Pennsylvania.

FOR EXCHANGE: European and Foreign Shells (recent and tertiary) for species new to me. Please *send full list of duplicates* when writing.

J. D. STAED, 123 rue Clovis, Rheims, Marne, France.

AN ANNOUNCEMENT!

The Index to The Nautilus—Part II

A continuation of the Index to THE NAUTILUS, with an additional Geographically arranged subject index, is nearing completion. Part II covers the issues from 1921 to 1931 (volumes 35 to 44 inclusive). It is planned to issue this index every ten years.

The forthcoming index will be printed on a good grade of Book paper and unless otherwise requested (with additional charge) will be bound with paper backs. The size will be the same as the Index published by George H. Clapp and Bryant Walker in 1927, and will consist of well over 100 pages with nearly 15,000 entries.

Due to the great amount of labor and the expense of publishing, it will be necessary to sell this issue of the index by subscription. The number printed will depend on the number of subscribers of THE NAUTILUS that order their copies within the next month or two. Please send orders promptly to STANLEY T. BROOKS, Curator of the Laboratory of Recent Invertebrates of the Carnegie Museum, PITTSBURGH, PENNSYLVANIA, U. S. A.

In order to facilitate the publication of the continuation of the Index to THE NAUTILUS please sign the following order:—

I hereby promise to pay upon receipt of the published work, by check or money order, a sum not to exceed three ($3.00) dollars. Special binding not included.

I also understand that if there is an insufficient demand and support by the Malacologists and other interested individuals and institutions this Index will *not be printed* and no responsibility will remain between the contracting parties.

Signed,.....

$2.00 per Year ($2.15 to Foreign Countries.) 50 cts. a copy

THE NAUTILUS

A QUARTERLY
DEVOTED TO THE INTERESTS
OF CONCHOLOGISTS

EDITORS AND PUBLISHERS:

HENRY A. PILSBRY, Curator of the Department of Mollusca, Academy of Natural Sciences, Philadelphia.

H. BURRINGTON BAKER, Associate Professor of Zoology, University of Pennsylvania.

Vol. XLVI. APRIL, 1933 No. 4

CONTENTS

HORACE B. BAKER, Business Manager,
Zoological Laboratory, University of Pennsylvania,
38th and Woodland Avenue, Philadelphia, Pa.

Entered as Second-Class matter October 29, 1932
at the Post-Office at Philadelphia, Pa., under the Act of March 3, 1879.

EXCHANGE NOTICES

FOR EXCHANGE: Fifteen varieties, Florida tree snails (*Liguus*) including three of the rare *solidus*, to exchange for Achatinella, Amphidromus, Bulimulus, Cochlostyla, Orthalicus, Porphyrobaphe and Placostylus. Send your list to

PAUL P. MCGINTY, 9010 Dexter Bl'd, Detroit, Mich.

WANTED: *Planorbis* of the *Helisoma* group from California, Oregon, and Washington, particularly with the animal. Exchanges offered in material from Arizona, Mexico, and South America. F. C. BAKER, Natural History Museum, University of Illinois, Urbana, Ill.

WANTED: Back Volumes and Numbers of THE NAUTILUS. Especially Vols. 3, 4, 18, 20, 21, 22, 23 and 24. Address

HORACE B. BAKER, Zool. Lab., Univ. Pennsylvania.

FOR EXCHANGE: European and Foreign Shells (recent and tertiary) for species new to me. Please *send full list of duplicates* when writing.

J. D. STAED, 123 rue Clovis, Rheims, Marne, France.

FOR EXCHANGE: Shells of the Pacific Coast of the United States and others, for Shells not in my collection. SEND LISTS.

MORRIS E. CARUTHERS, 120 East Chestnut Street,
Glendale, California.

WANTED: Publications on Tertiary shells by Conrad, Gabb, Aldrich, Dall, etc. Also Tertiary or Recent shells in exchange for Tertiary fossils of Texas. H. B. STENZEL, P. O. Box 151, College Station, Texas.

AN ANNOUNCEMENT!

The Index to The Nautilus—Part II

A continuation of the Index to THE NAUTILUS, with an additional Geographically arranged subject index, is nearing completion. Part II covers the issues from 1921 to 1931 (volumes 35 to 44 inclusive). It is planned to issue this index every ten years.

The forthcoming index will be printed on a good grade of Book paper and unless otherwise requested (with additional charge) will be bound with paper backs. The size will be the same as the Index published by George H. Clapp and Bryant Walker in 1927, and will consist of well over 100 pages with nearly 15,000 entries.

Due to the great amount of labor and the expense of publishing, it will be necessary to sell this issue of the index by subscription. The number printed will depend on the number of subscribers of THE NAUTILUS that order their copies within the next month or two. Please send orders promptly to STANLEY T. BROOKS, Curator of the Laboratory of Recent Invertebrates of the Carnegie Museum, PITTSBURGH, PENNSYLVANIA, U. S. A.

In order to facilitate the publication of the continuation of the Index to THE NAUTILUS please sign the following order:—

I hereby promise to pay upon receipt of the published work, by check or money order, a sum not to exceed three ($3.00) dollars. Special binding not included.

I also understand that if there is an insufficient demand and support by the Malacologists and other interested individuals and institutions this Index will *not be printed* and no responsibility will remain between the contracting parties.

Signed,.....